US009574819B2

(12) **United States Patent**
Kang et al.

(10) **Patent No.: US 9,574,819 B2**
(45) **Date of Patent: Feb. 21, 2017**

(54) **REFRIGERATOR**

(71) Applicant: **SAMSUNG ELECTRONICS CO., LTD.**, Suwon-si, Gyeonggi-do (KR)

(72) Inventors: **Byeong Kook Kang**, Seoul (KR); **Sang Bum Kim**, Gwangmyeong-si (KR)

(73) Assignee: **SAMSUNG ELECTRONICS CO., LTD.**, Suwon-si (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/591,314**

(22) Filed: **Jan. 7, 2015**

(65) **Prior Publication Data**

US 2015/0192356 A1 Jul. 9, 2015

(30) **Foreign Application Priority Data**

Jan. 7, 2014 (KR) 10-2014-0002010
Jul. 16, 2014 (KR) 10-2014-0089566

(51) **Int. Cl.**
F25D 23/00 (2006.01)
F25D 23/06 (2006.01)

(52) **U.S. Cl.**
CPC ***F25D 23/064*** (2013.01); *F25D 2201/14* (2013.01)

(58) **Field of Classification Search**
CPC F25D 23/065; F25D 23/062; F25D 23/064; F25D 23/066; F25D 11/00; F25D 2201/12
USPC 312/406, 406.1, 400, 401, 409
See application file for complete search history.

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Primary Examiner — Janet M Wilkens
(74) *Attorney, Agent, or Firm* — Staas & Halsey LLP

(57) **ABSTRACT**

A body of a refrigerator may be deformed when the rigidity of the body is lowered due to a thickness of insulation being reduced to increase an internal capacity of the body. Deformation of the body of the refrigerator is reduced by improving rigidity of the body using a reinforcement structure. The refrigerator may include an electric apparatus box in which electric apparatus components for controlling an operation of the refrigerator are accommodated. Electric components may be disposed in a hinge cover which is disposed in the front of the refrigerator to improve spatial utility and a reinforcement plate formed of a steel material may be disposed in the electric apparatus box to prevent a fire from spreading.

19 Claims, 49 Drawing Sheets

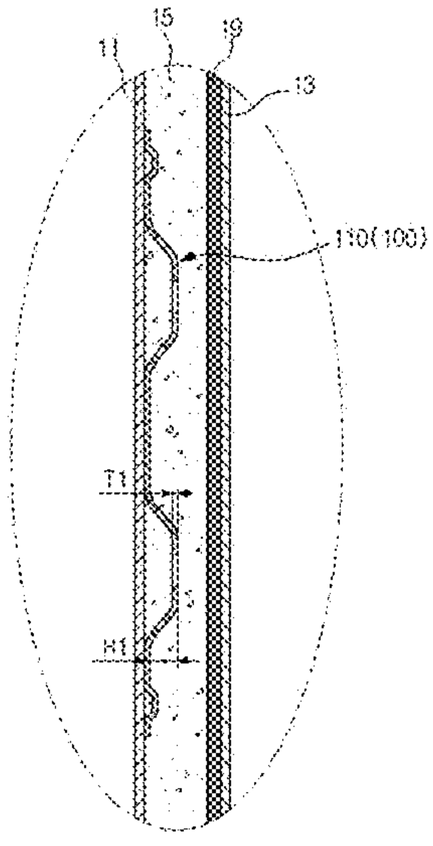

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FIG. 1

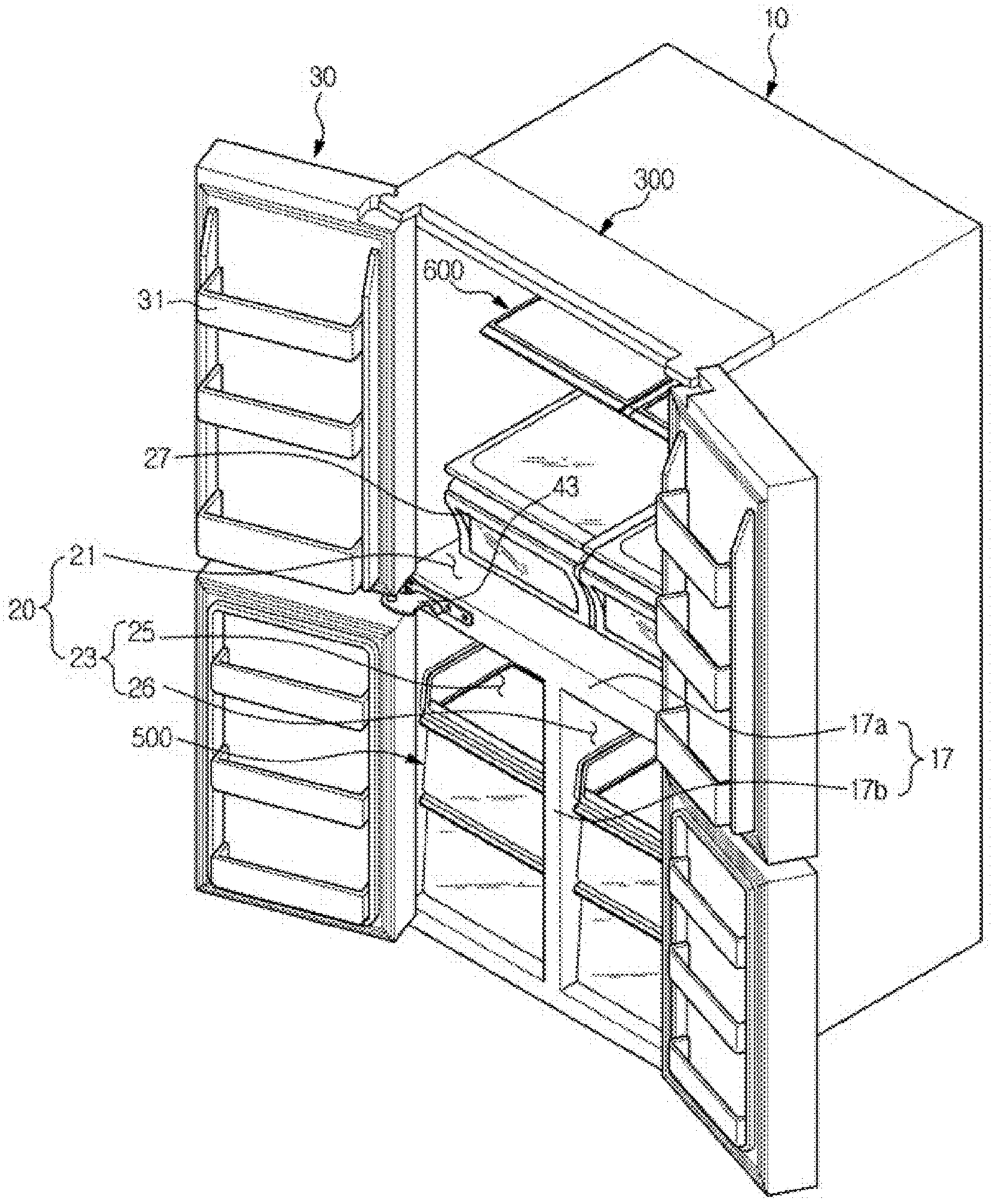
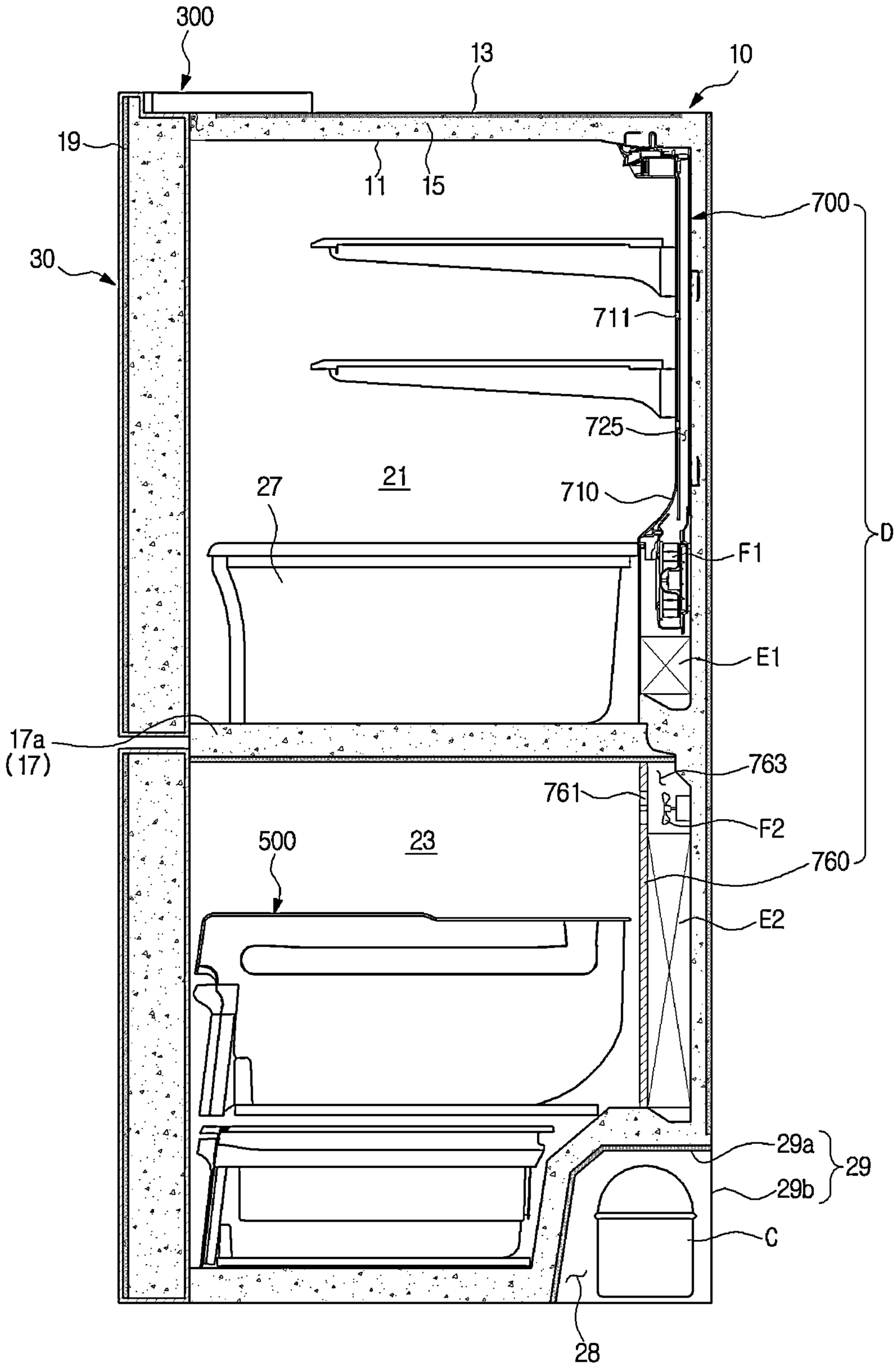


FIG. 2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F2
500
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29a
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29b
C
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FIG. 3

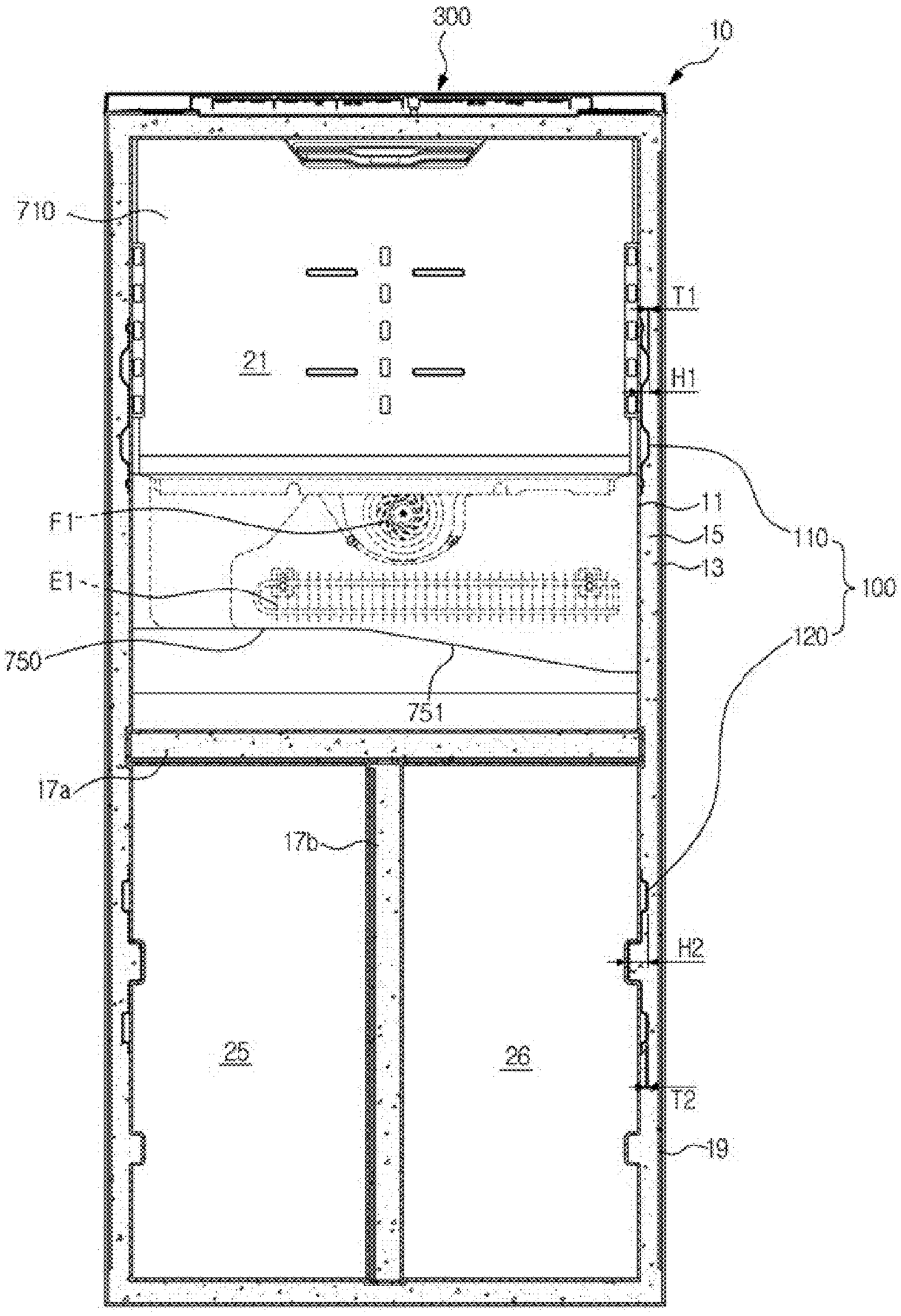
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FIG. 4

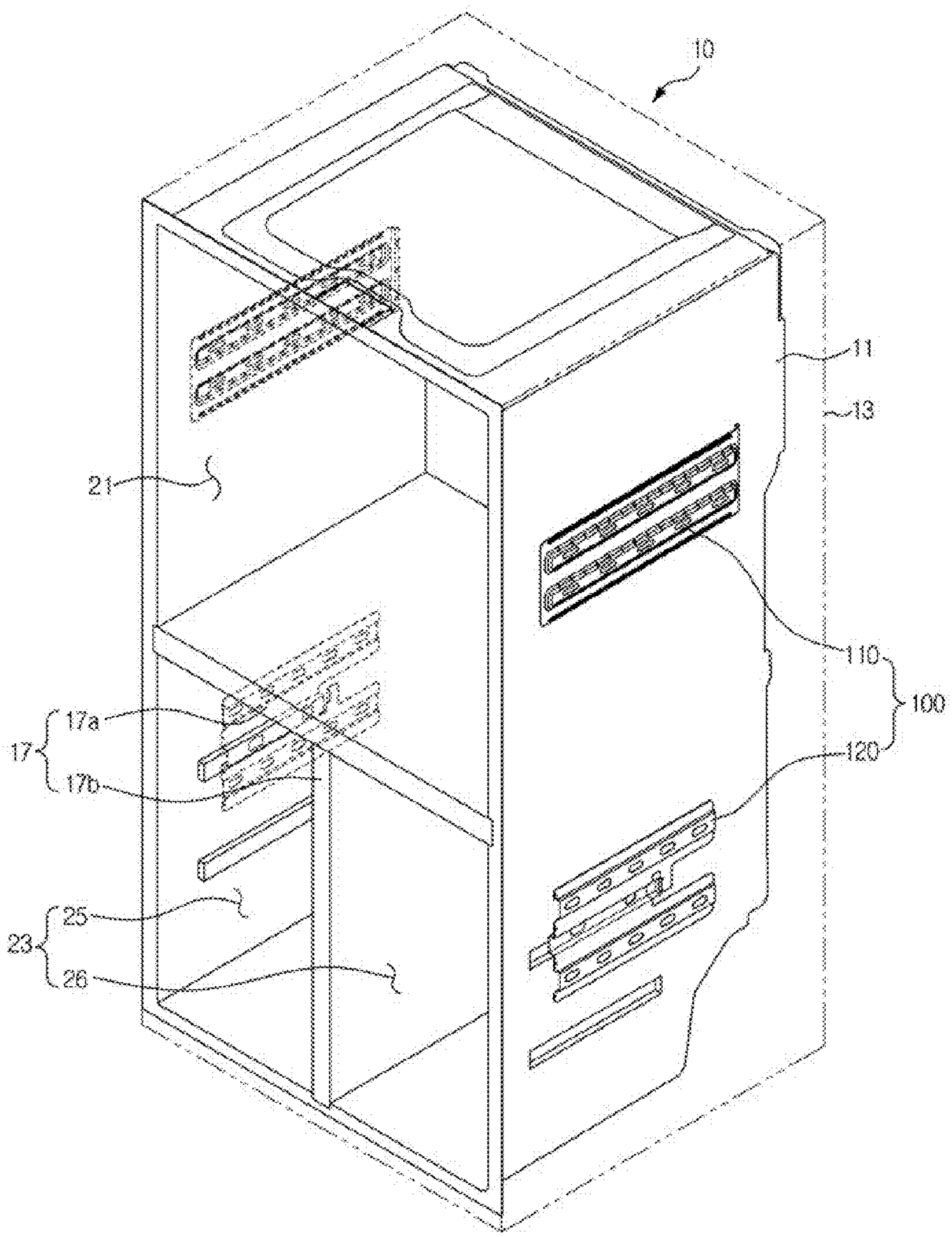


FIG. 5

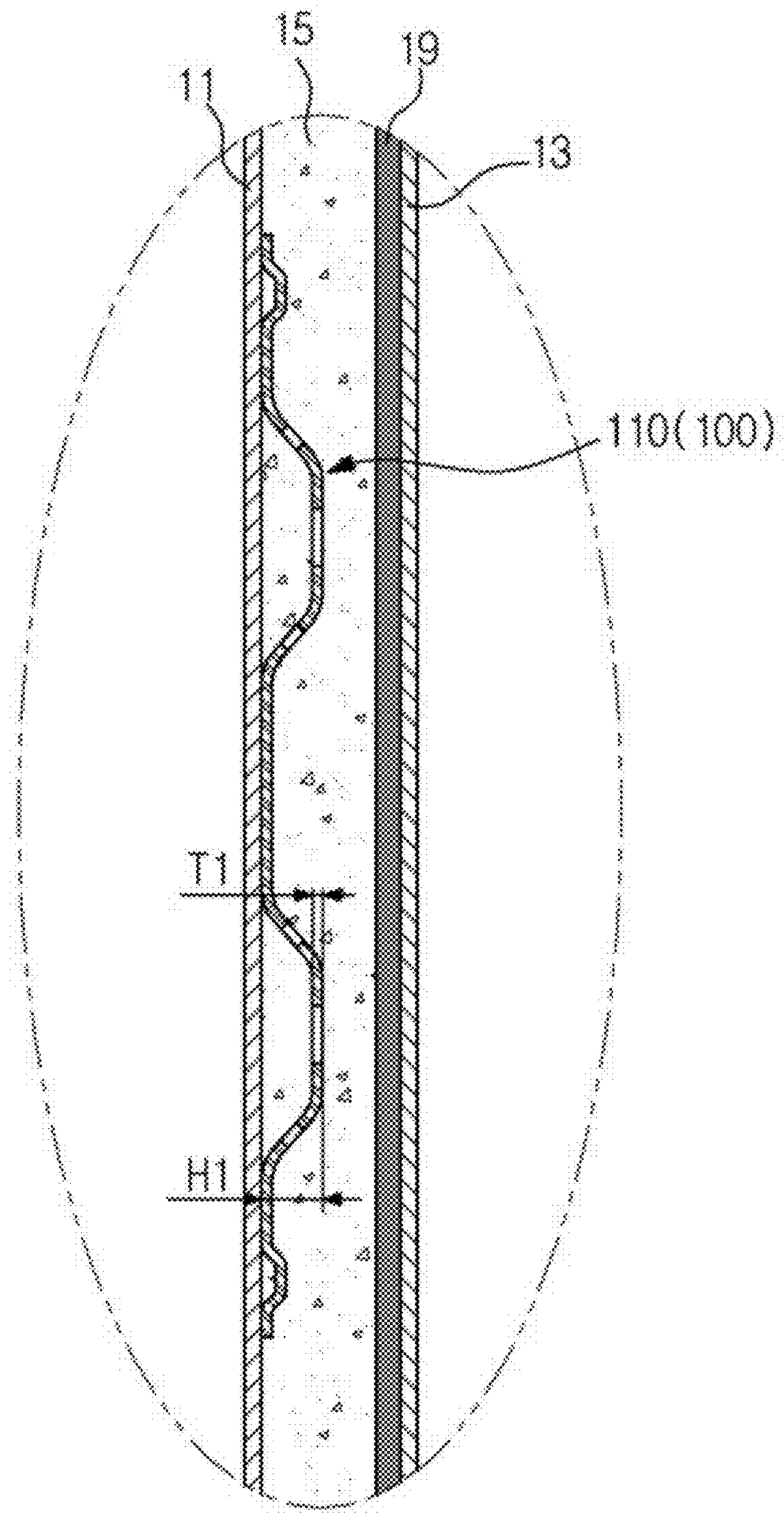


FIG. 6

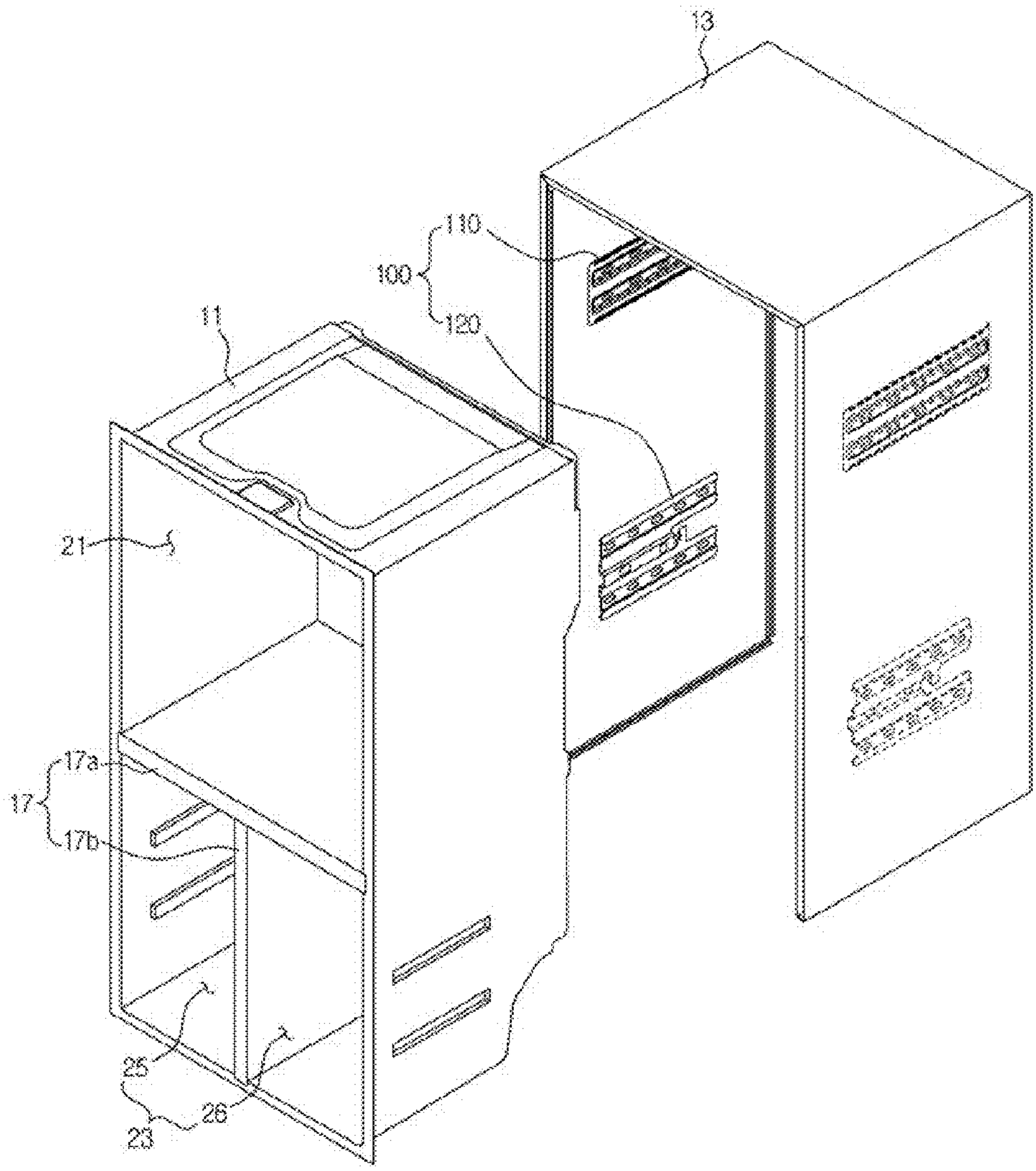


FIG. 7

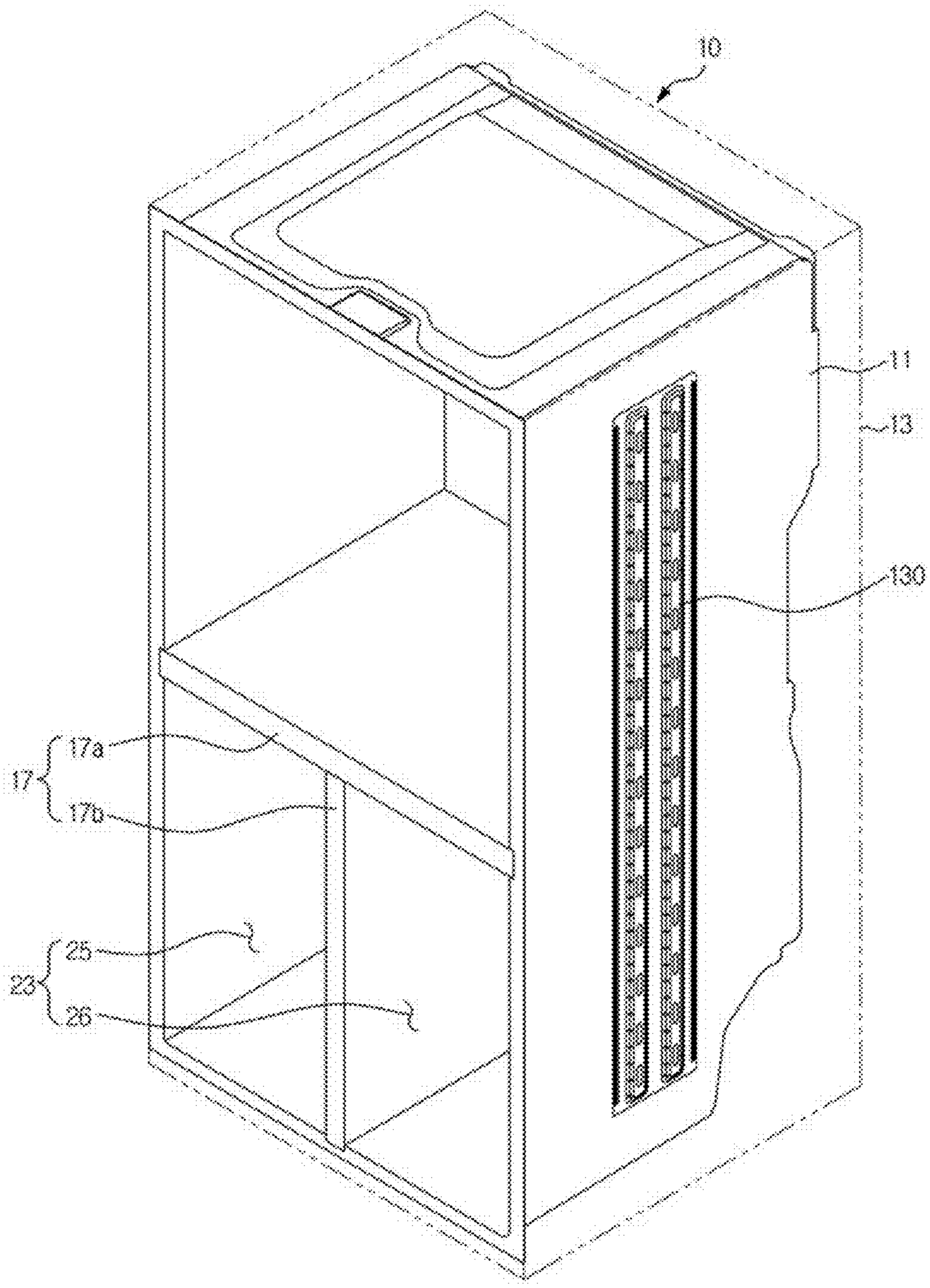


FIG. 8

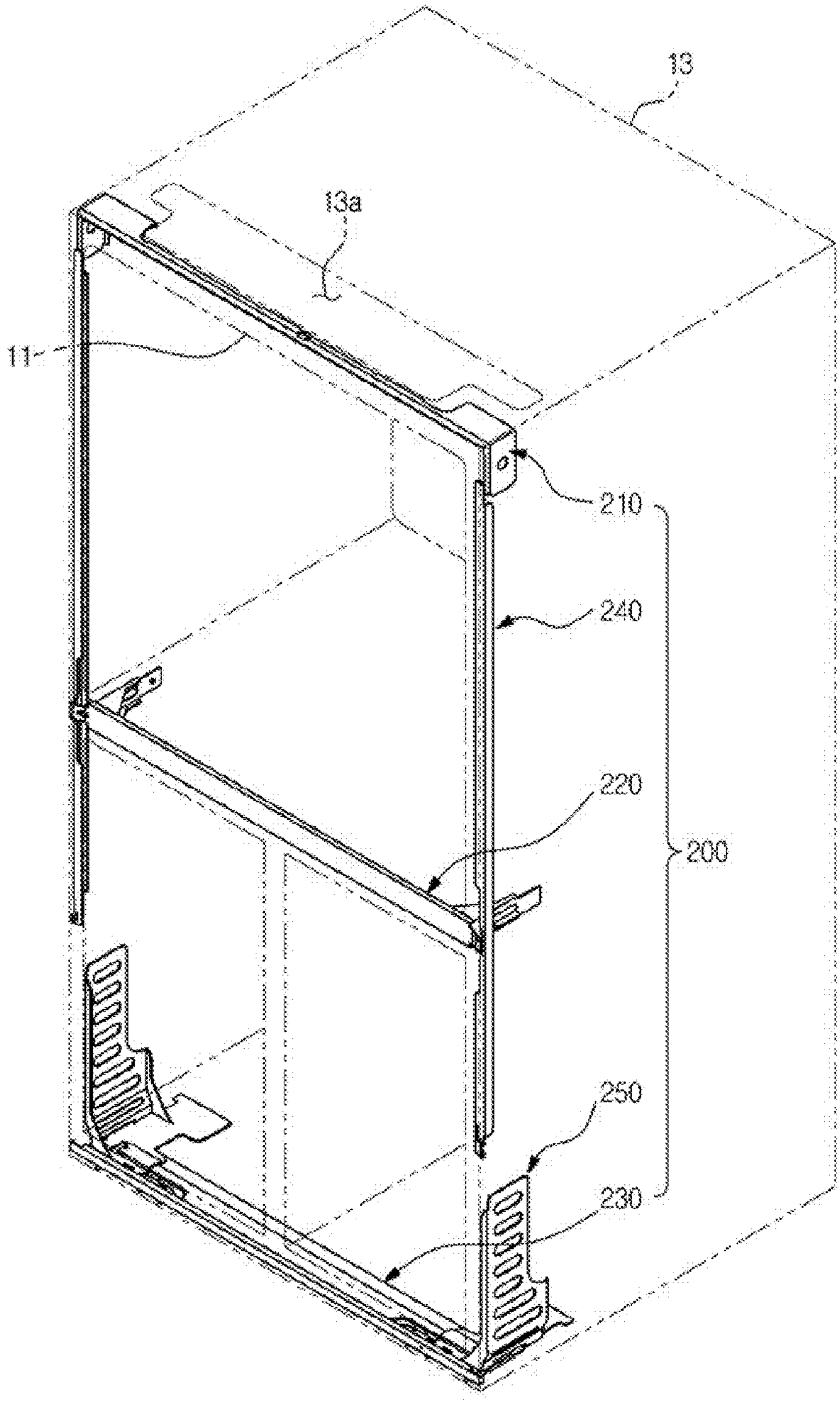


FIG. 9

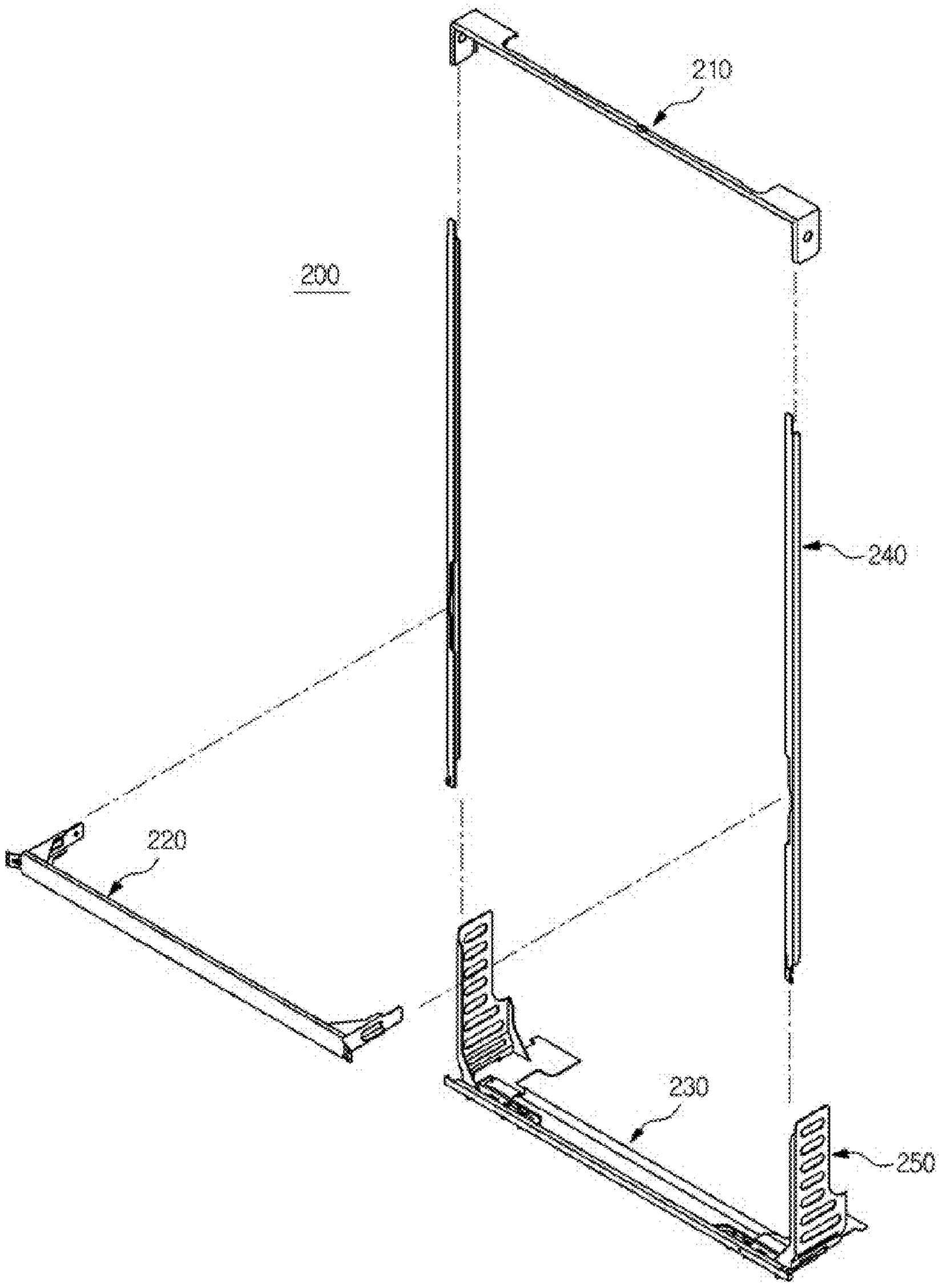
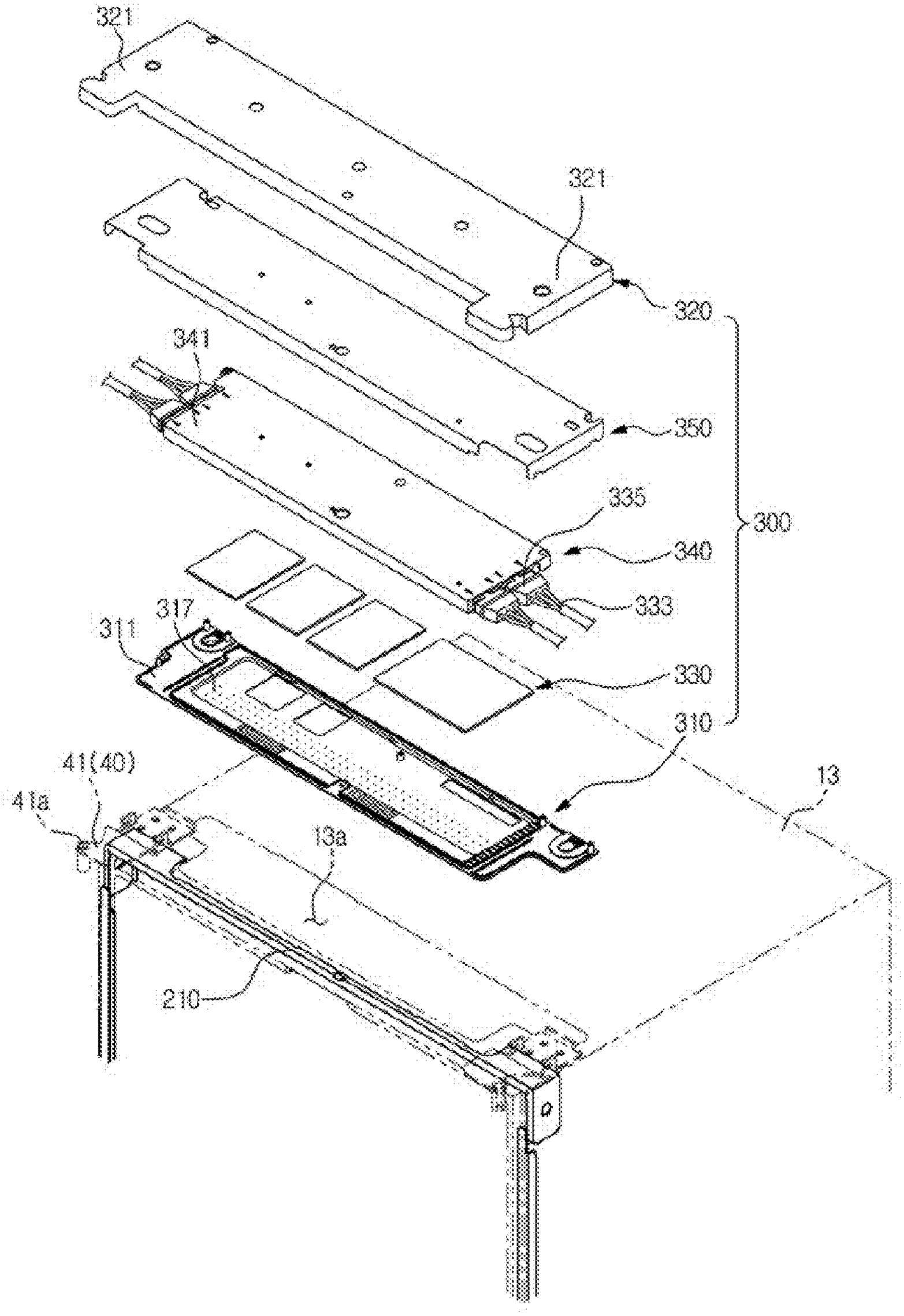


FIG. 10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41(40)
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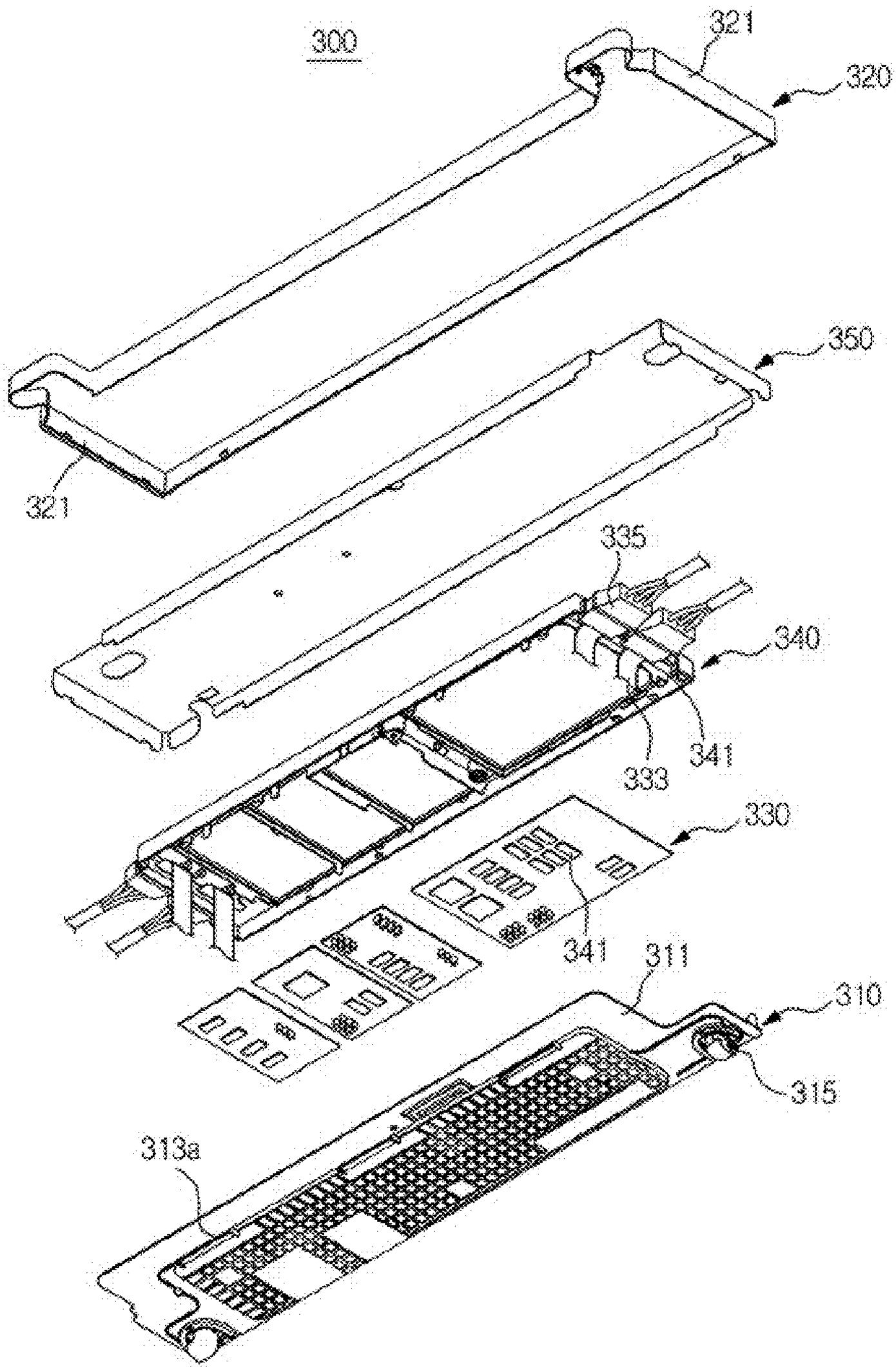
FIG. 11



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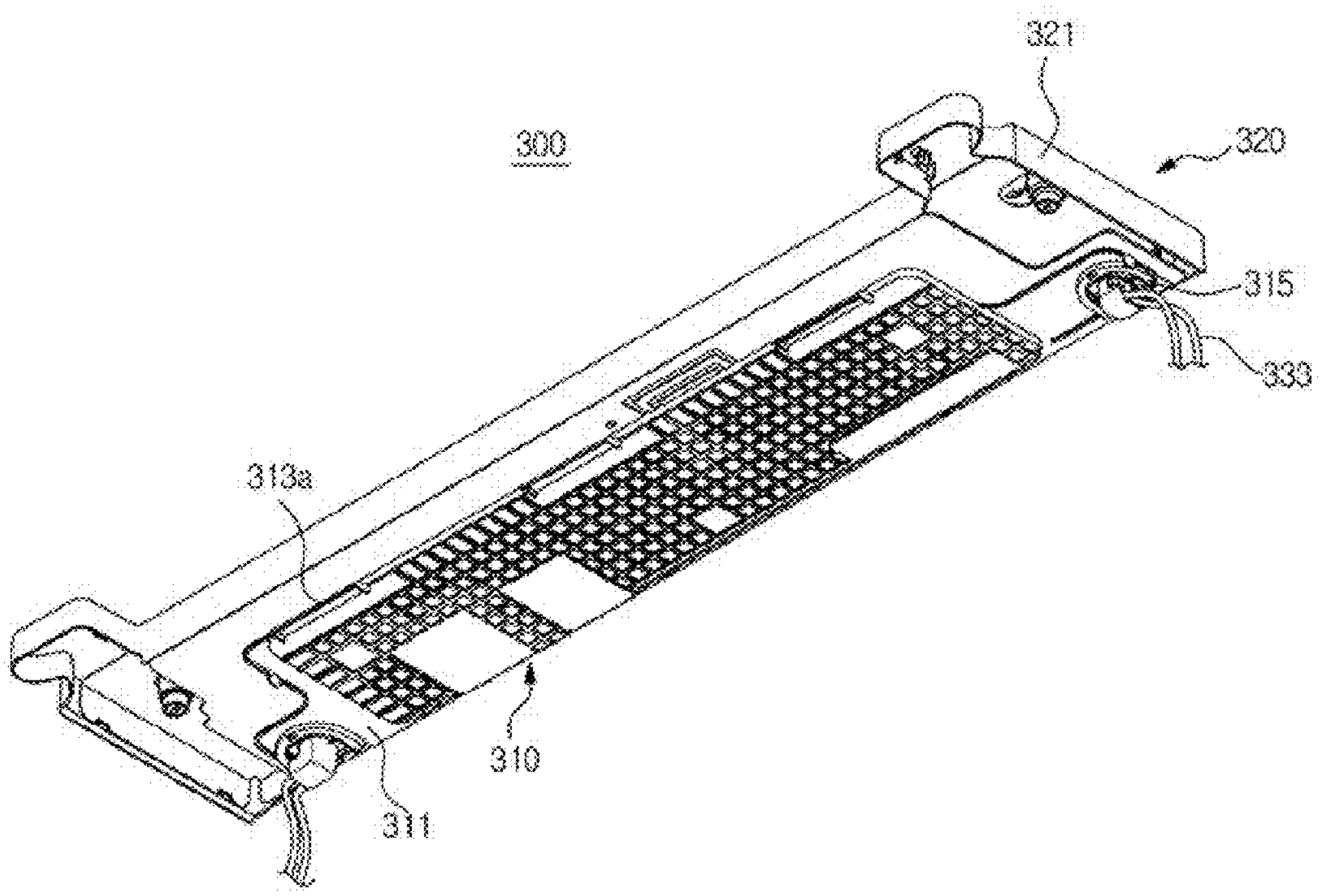
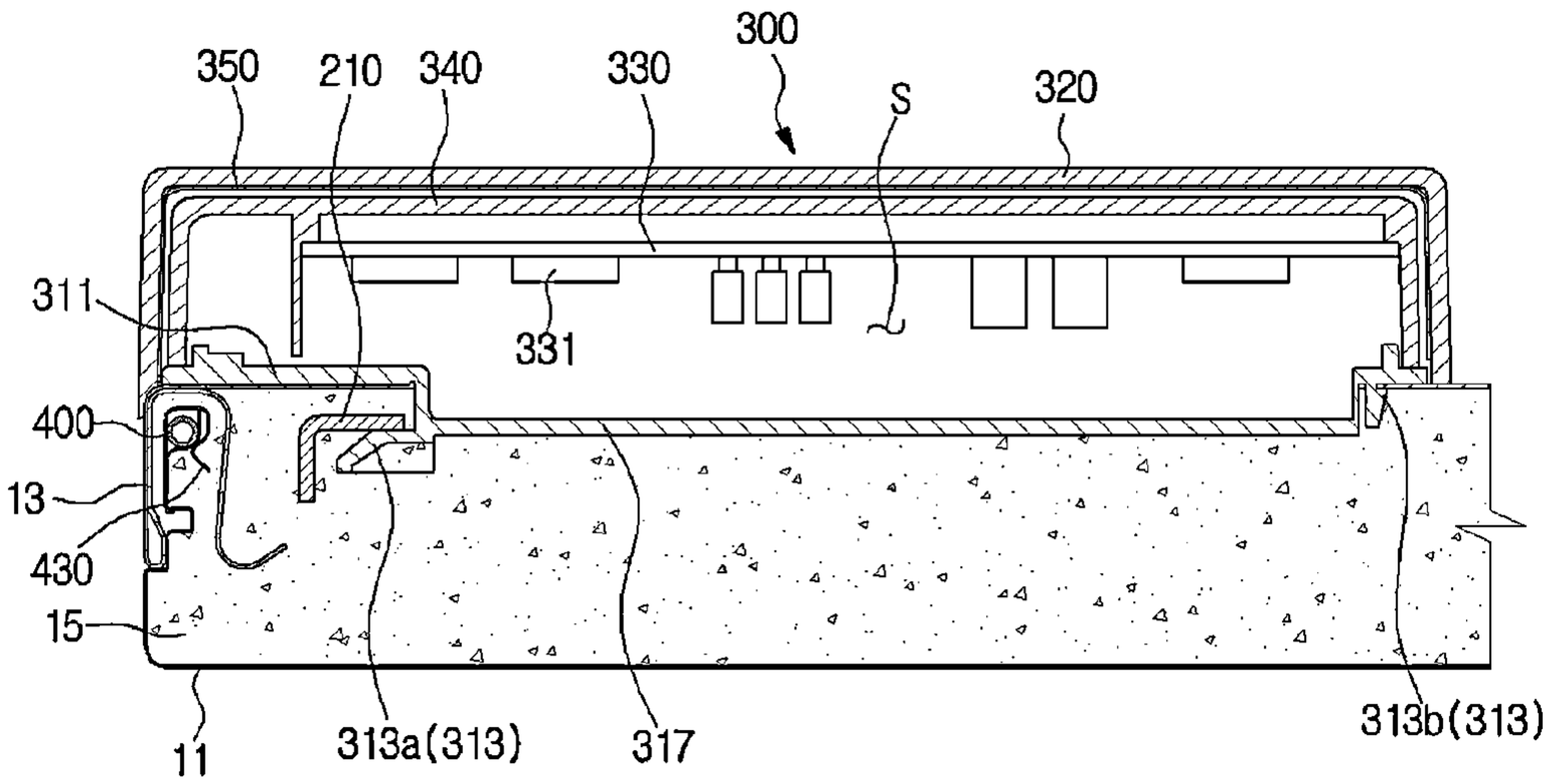


FIG. 13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313b(313)

FIG. 14

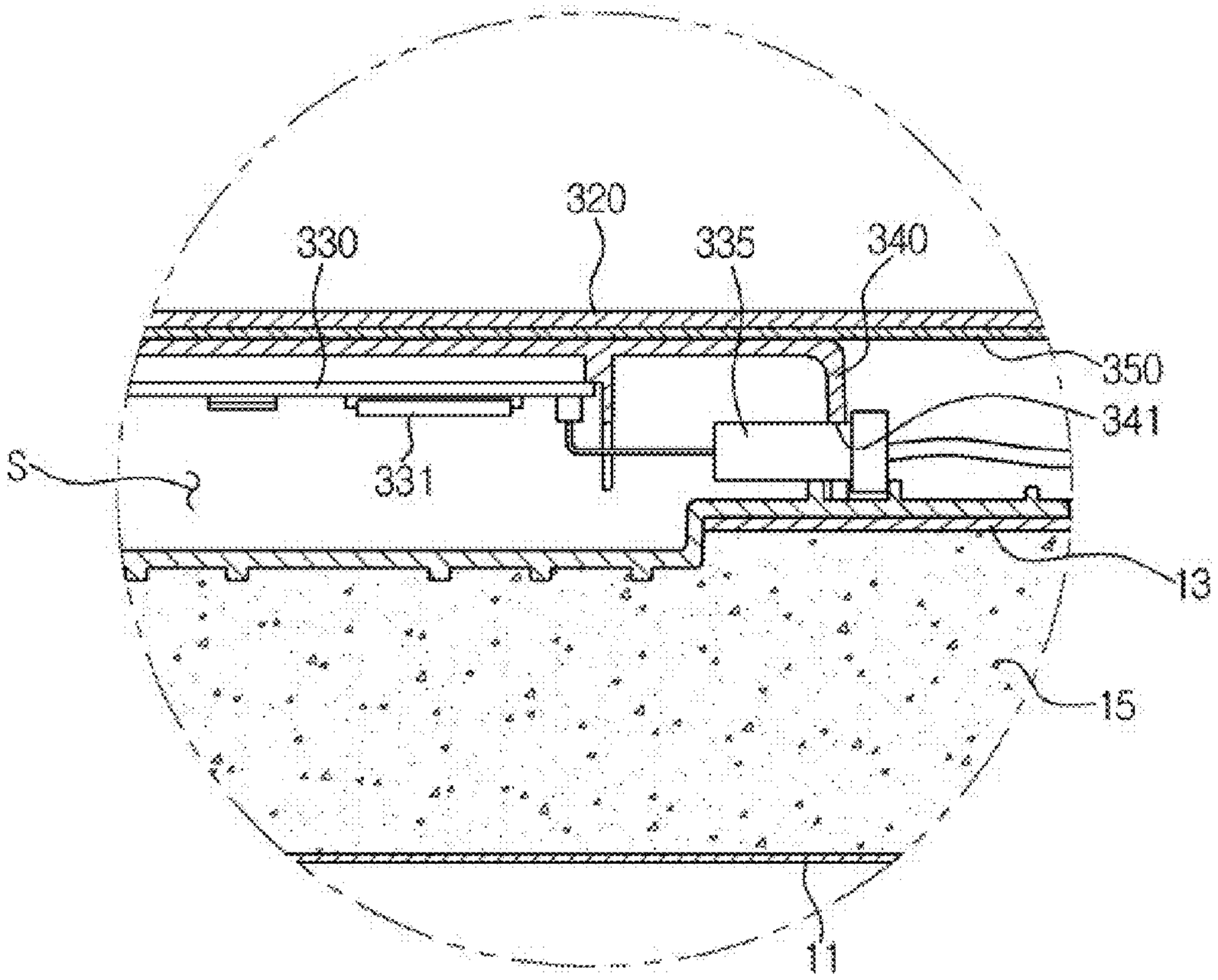


FIG. 15

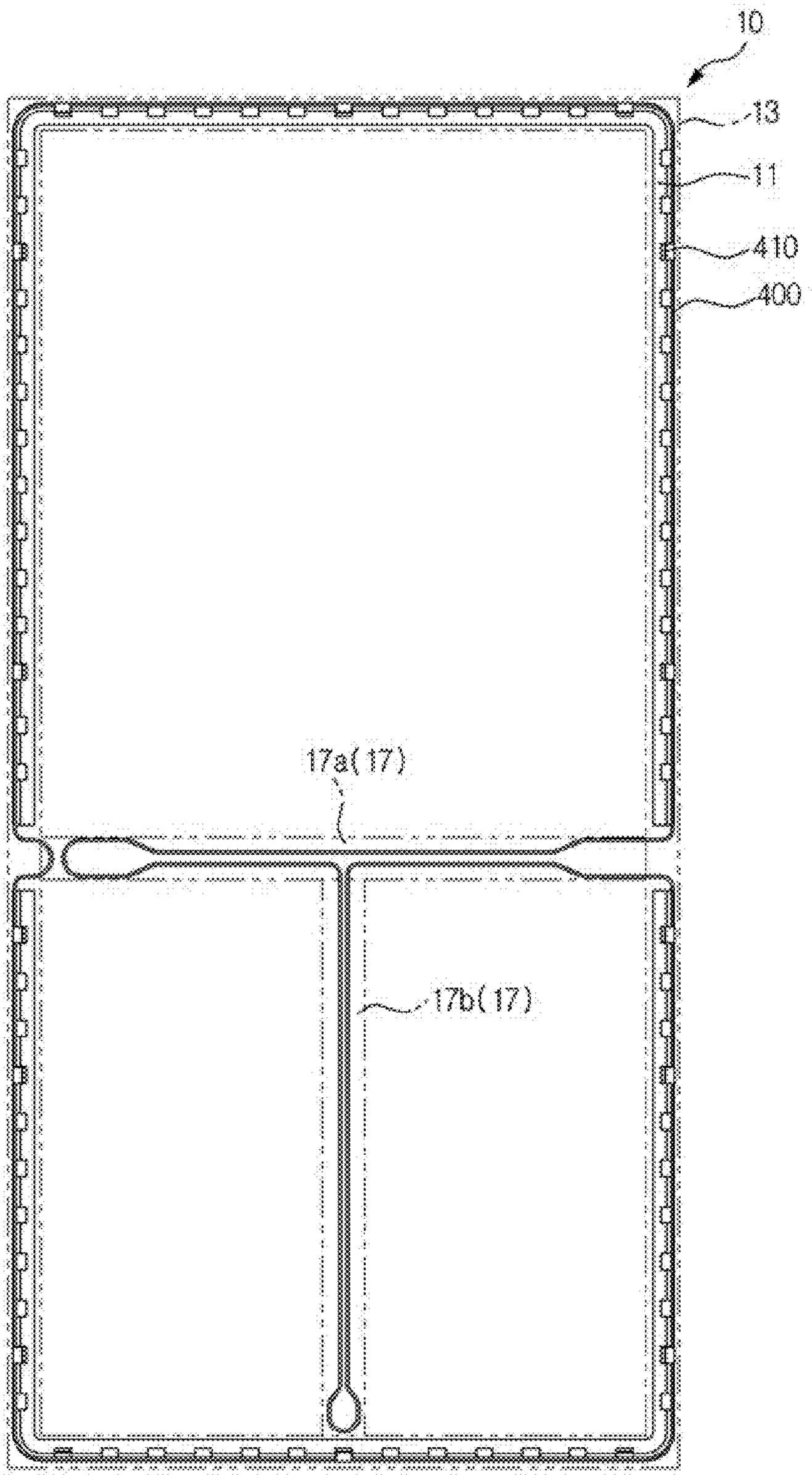


FIG. 16

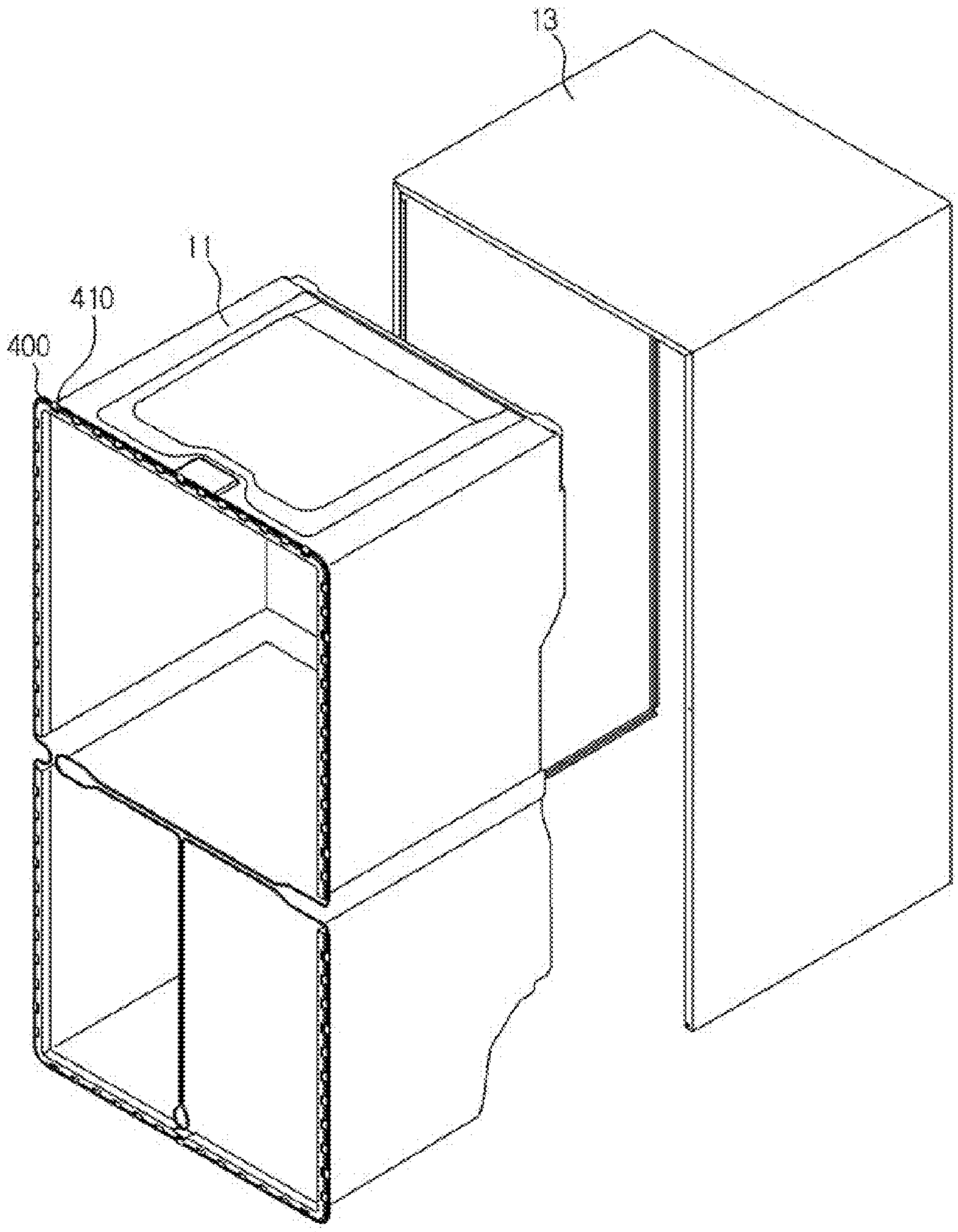
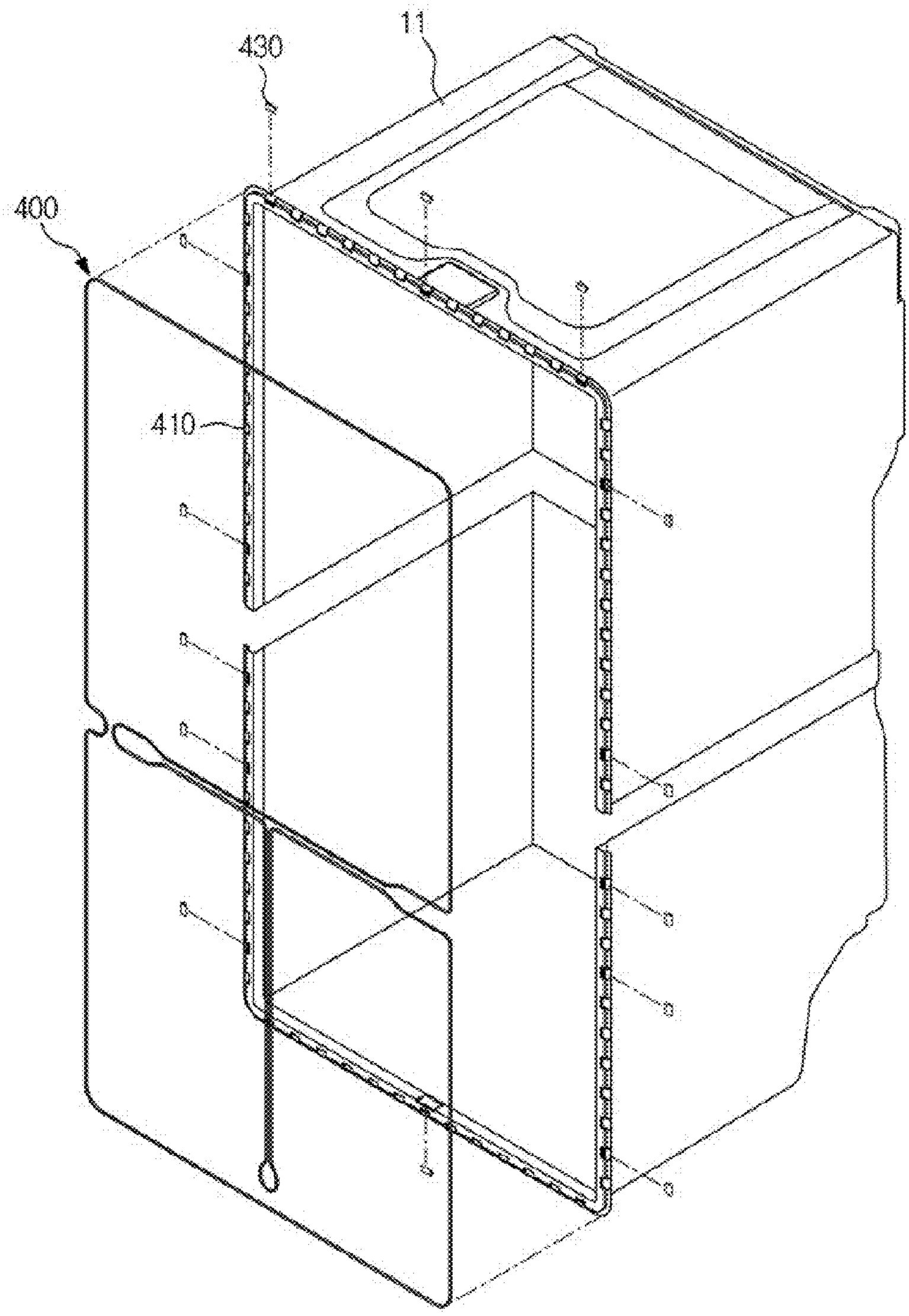


FIG. 17



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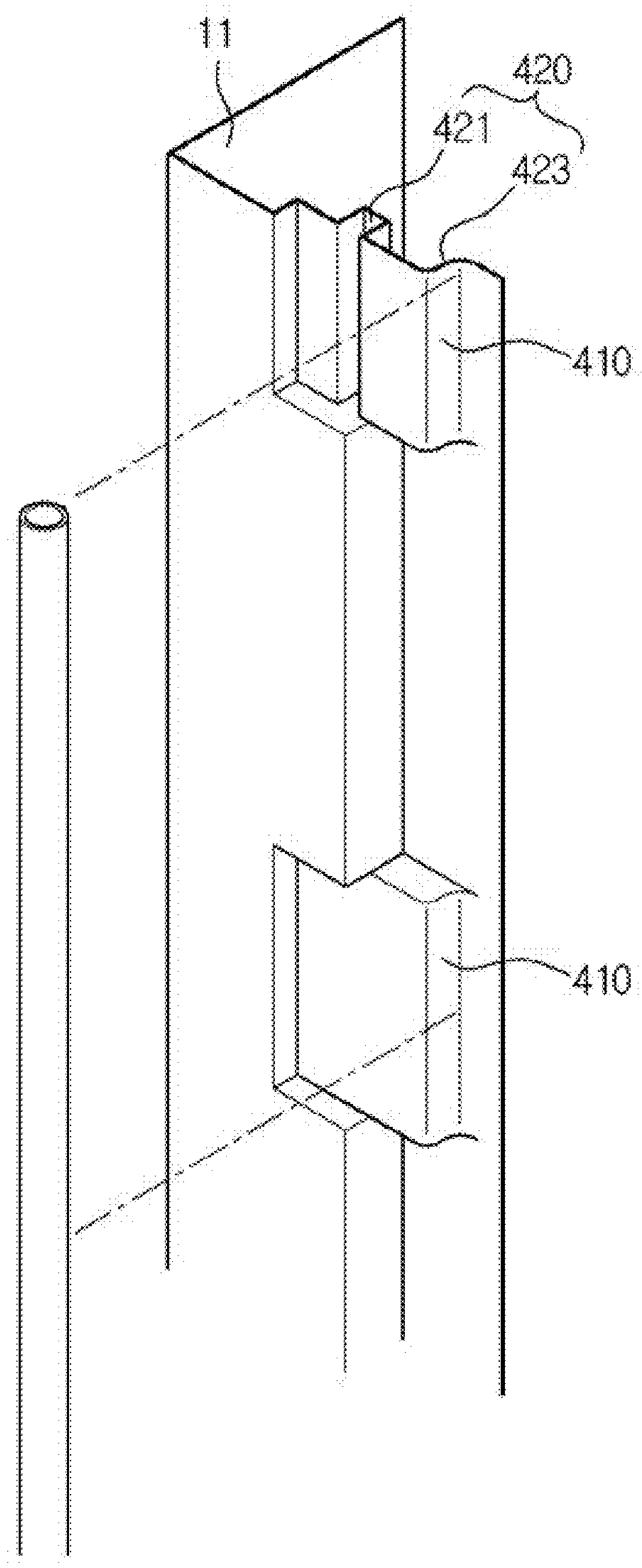

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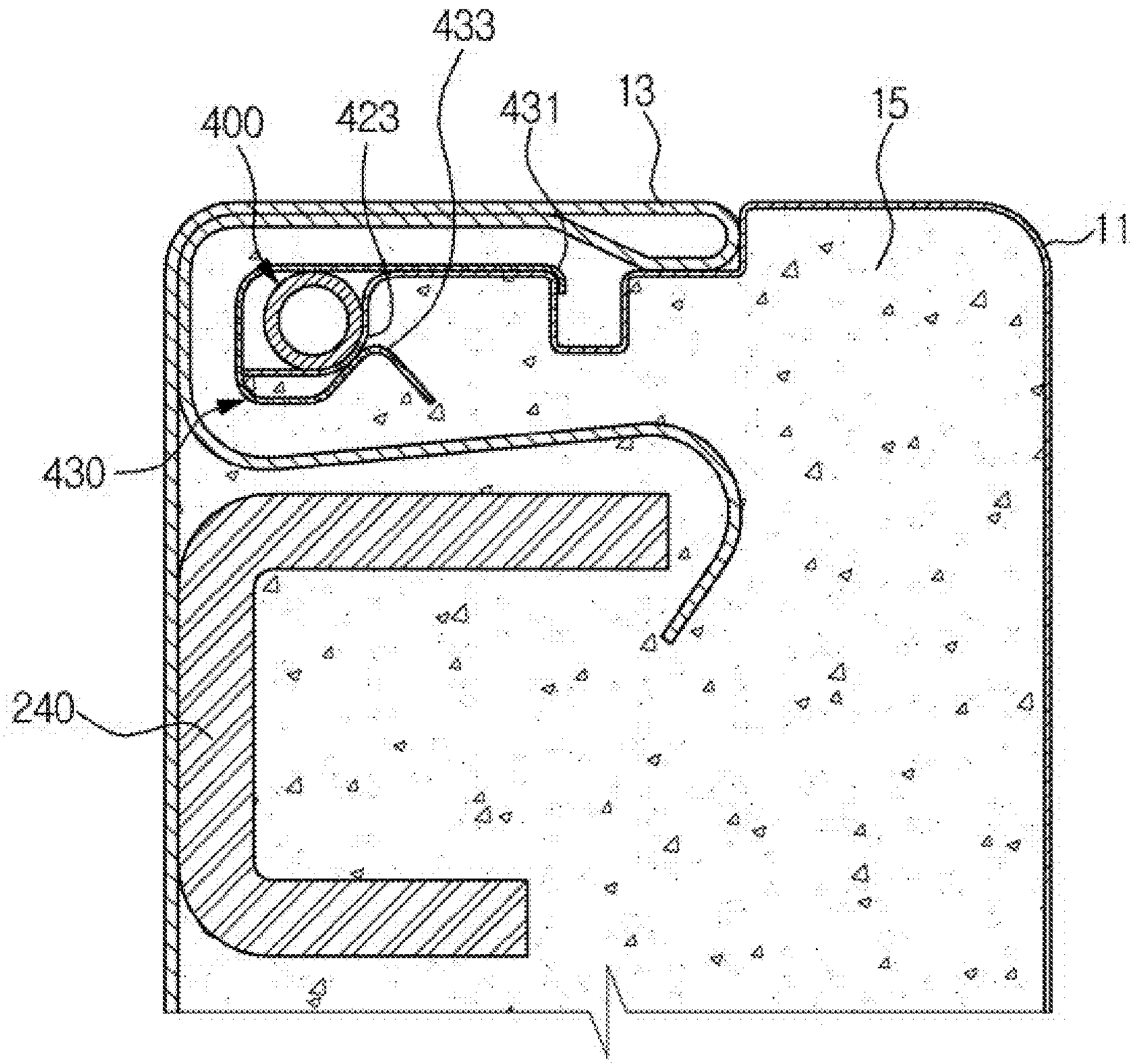

FIG. 20

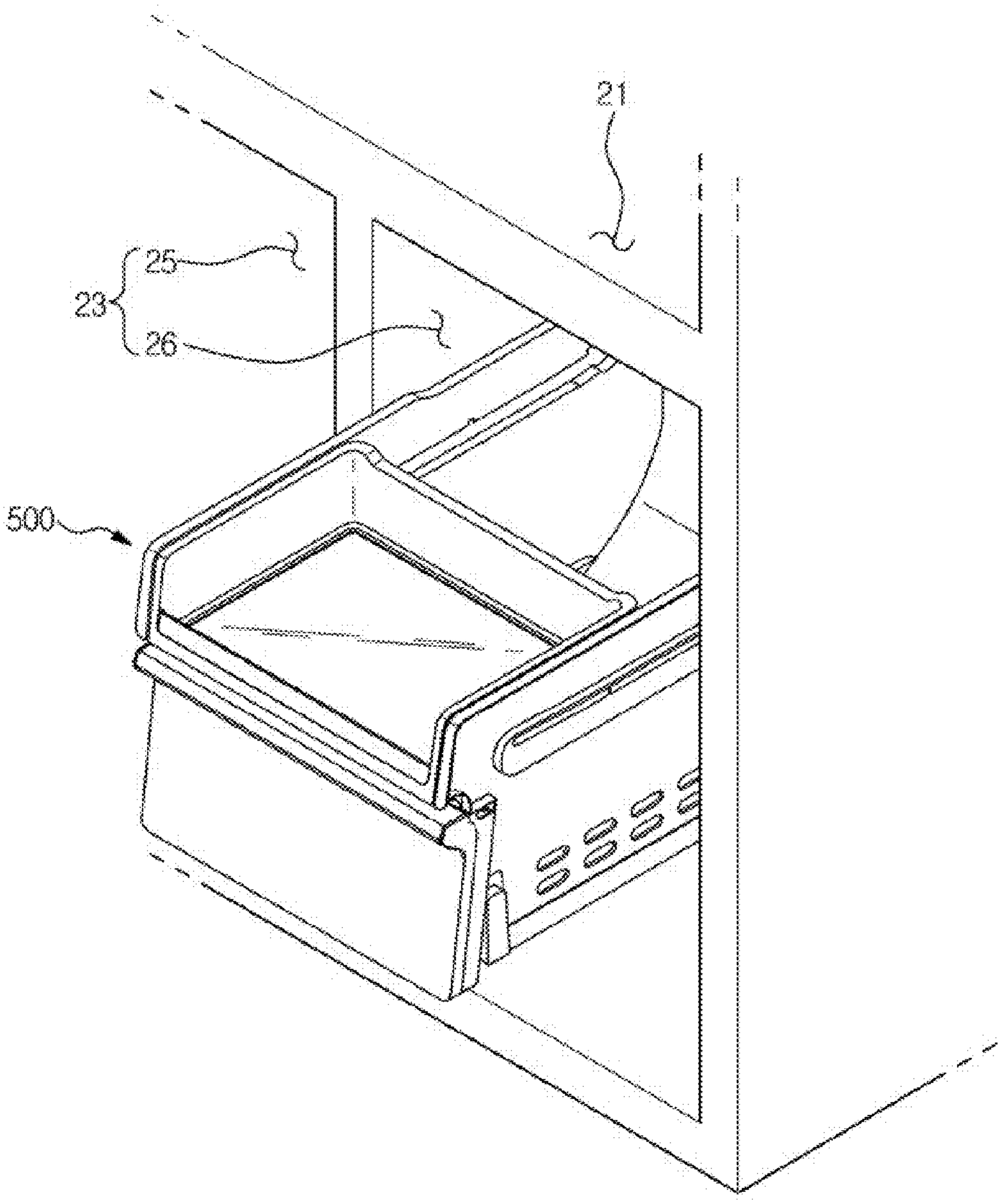

FIG. 21

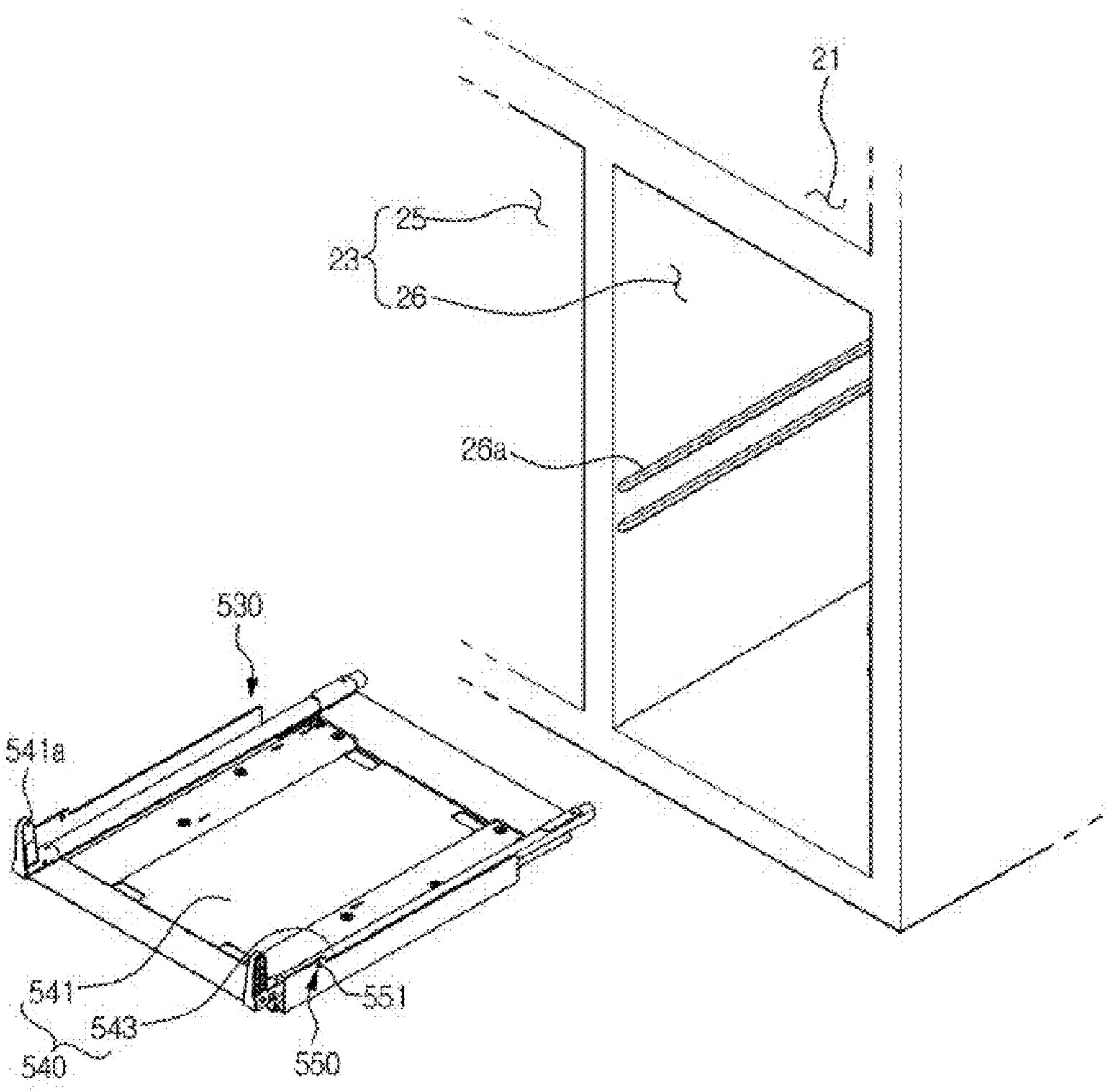

FIG. 22

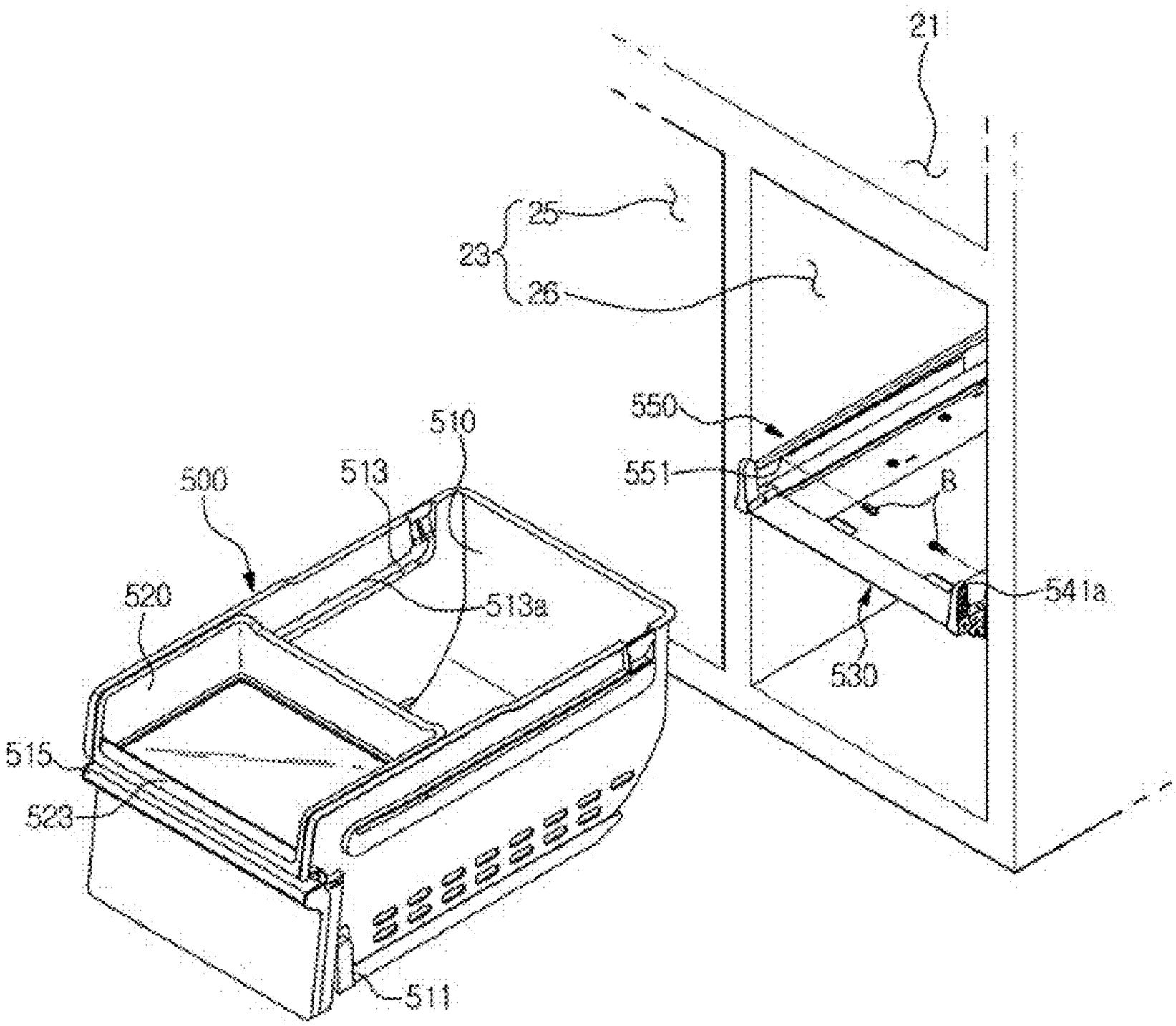

FIG. 23

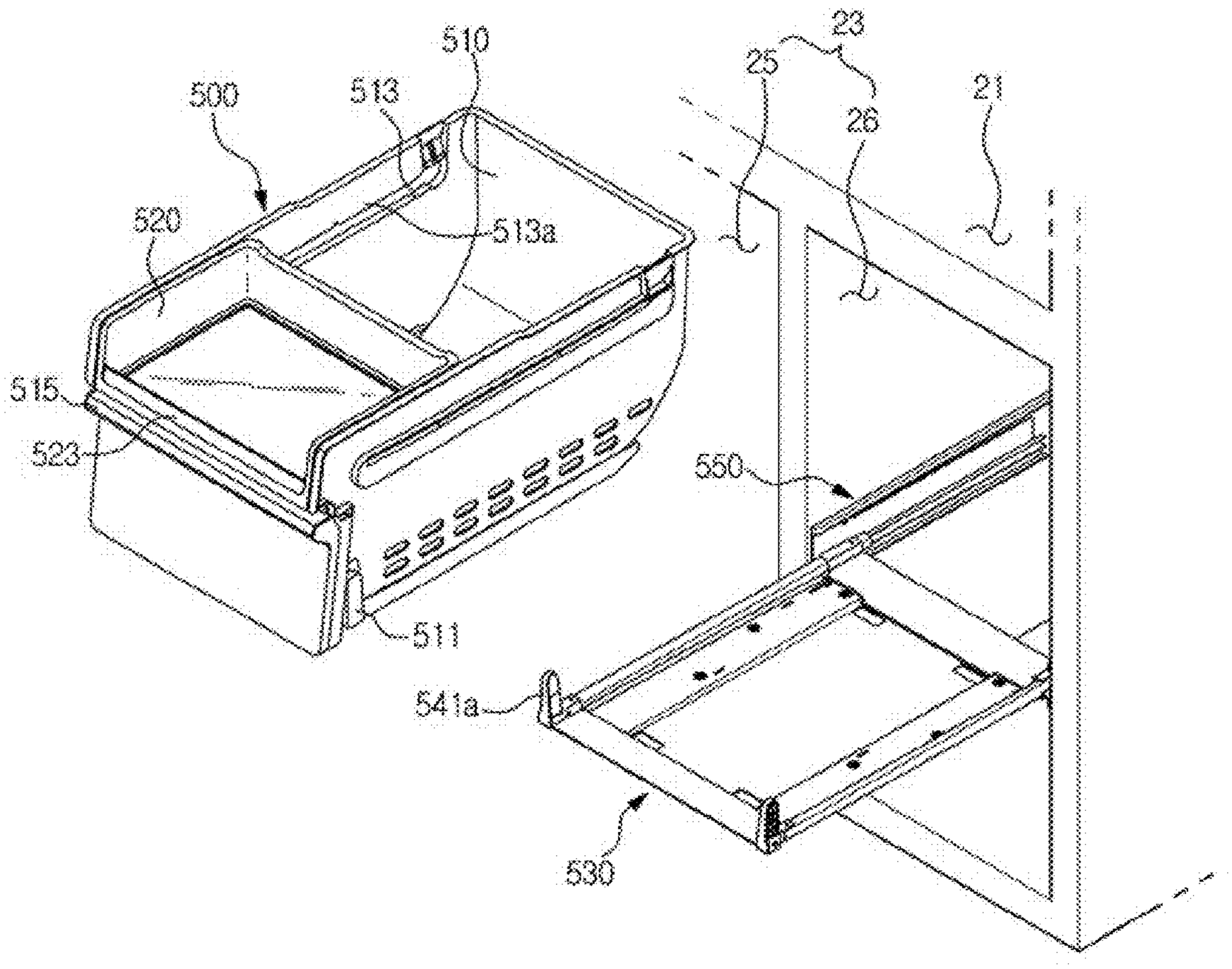

FIG. 24

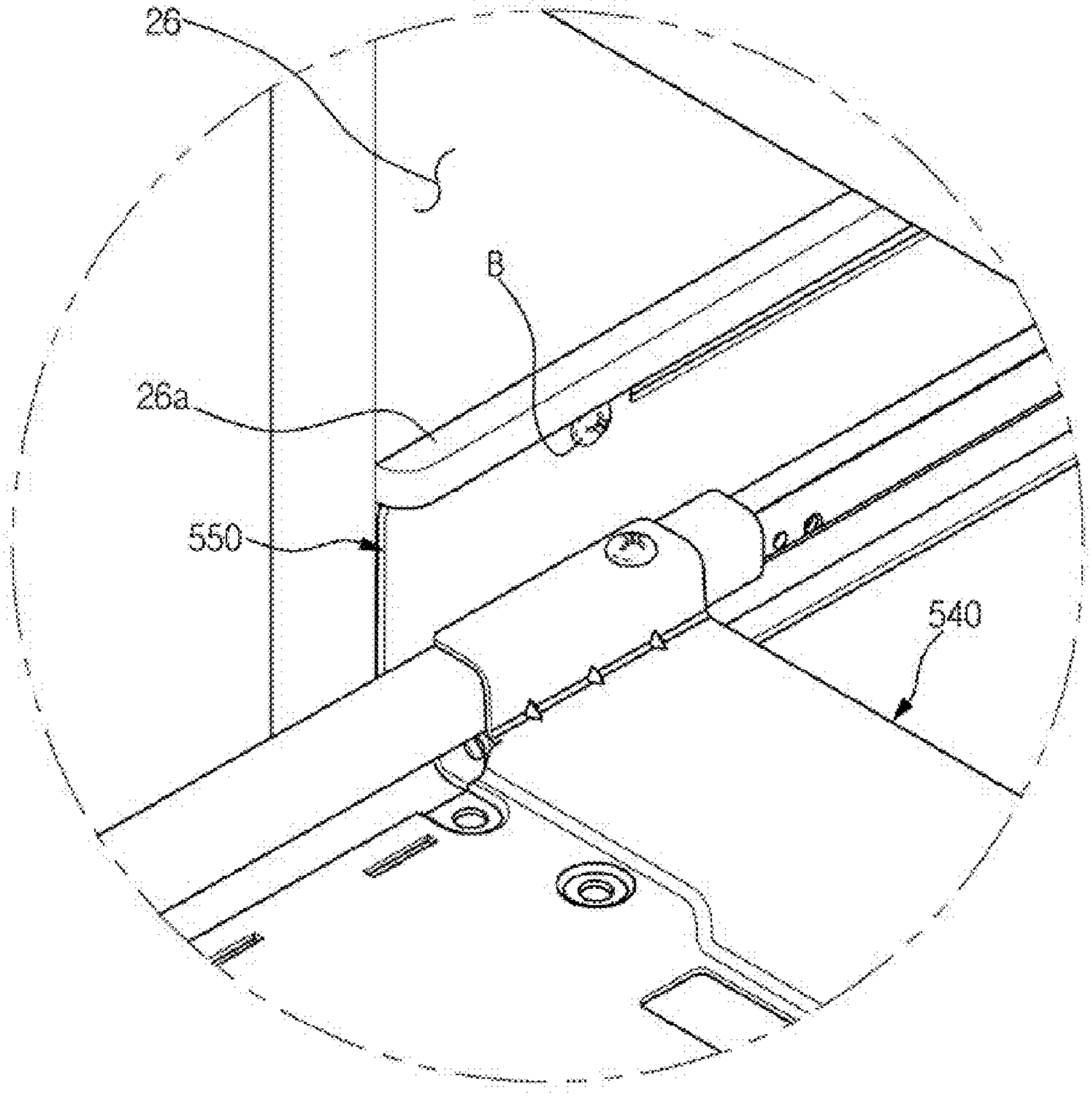

FIG. 25

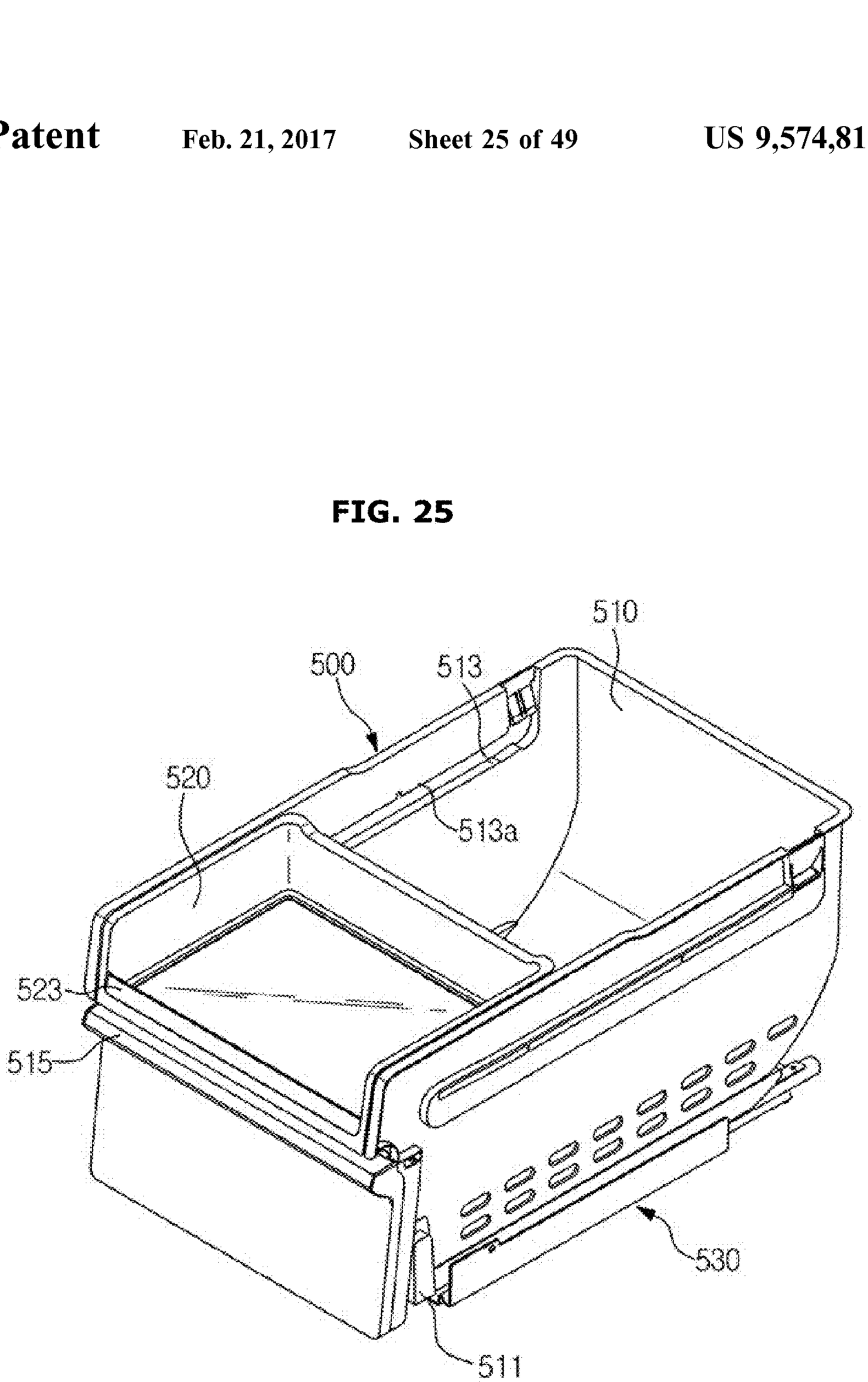

FIG. 26

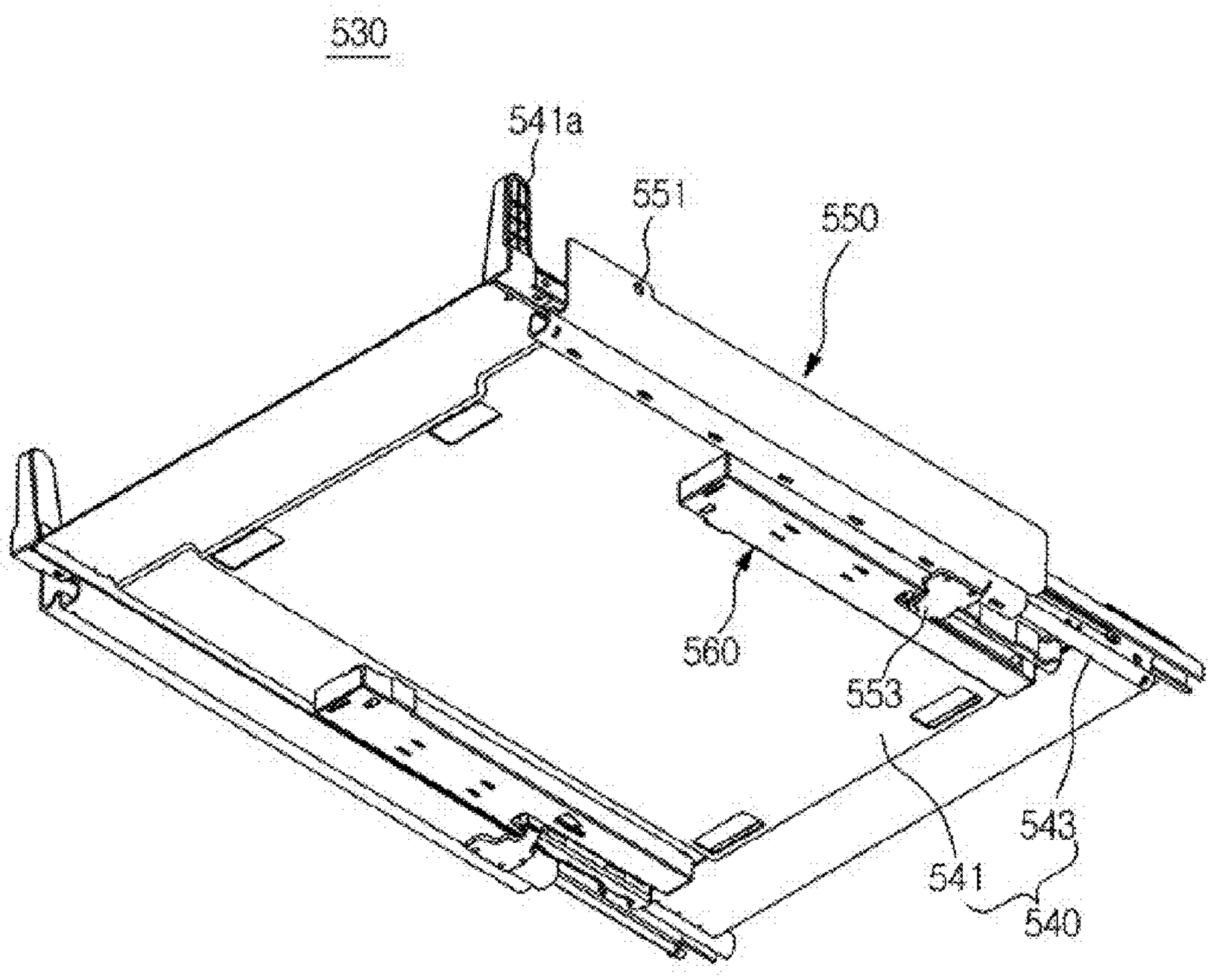

FIG. 27

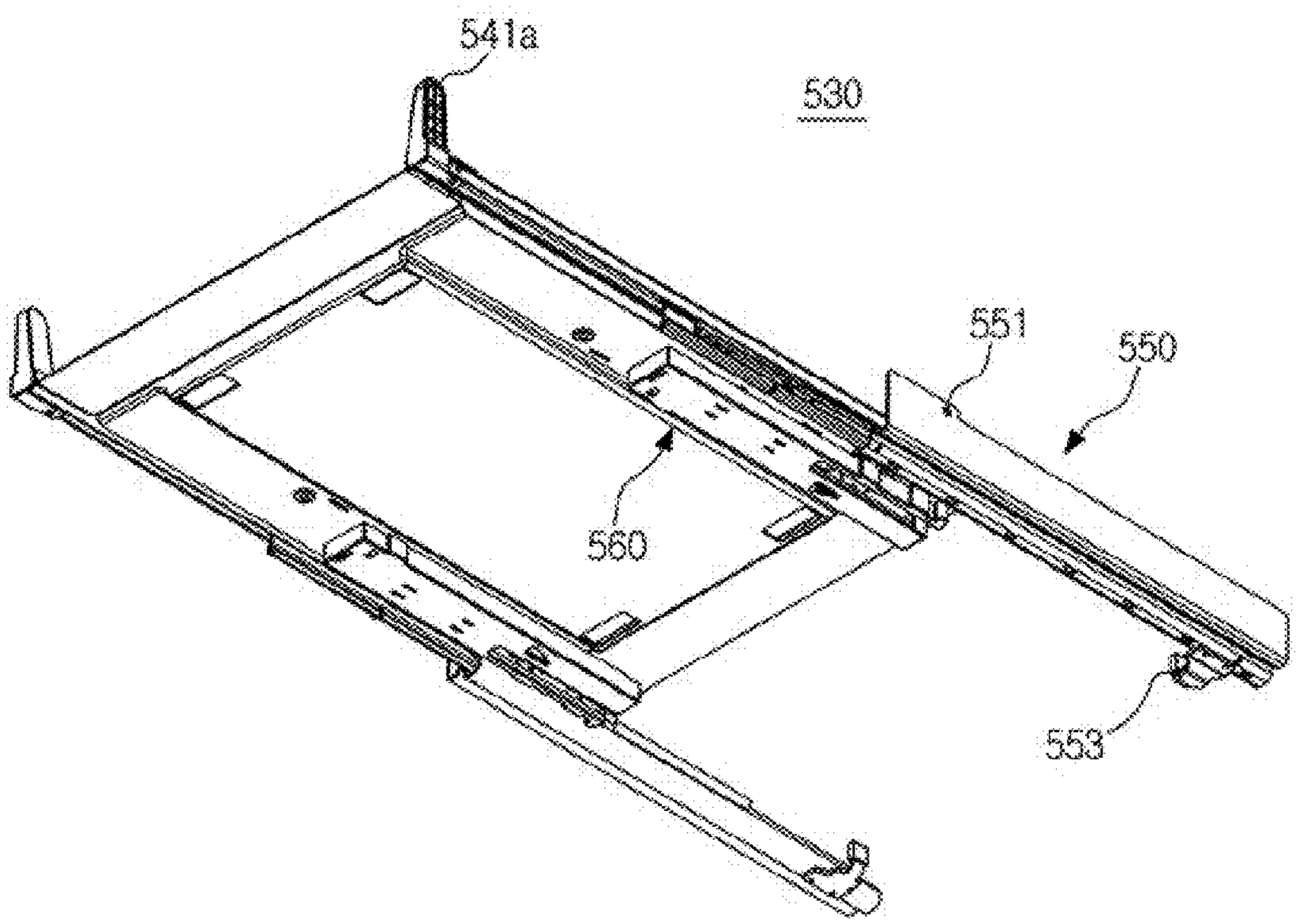

FIG. 28

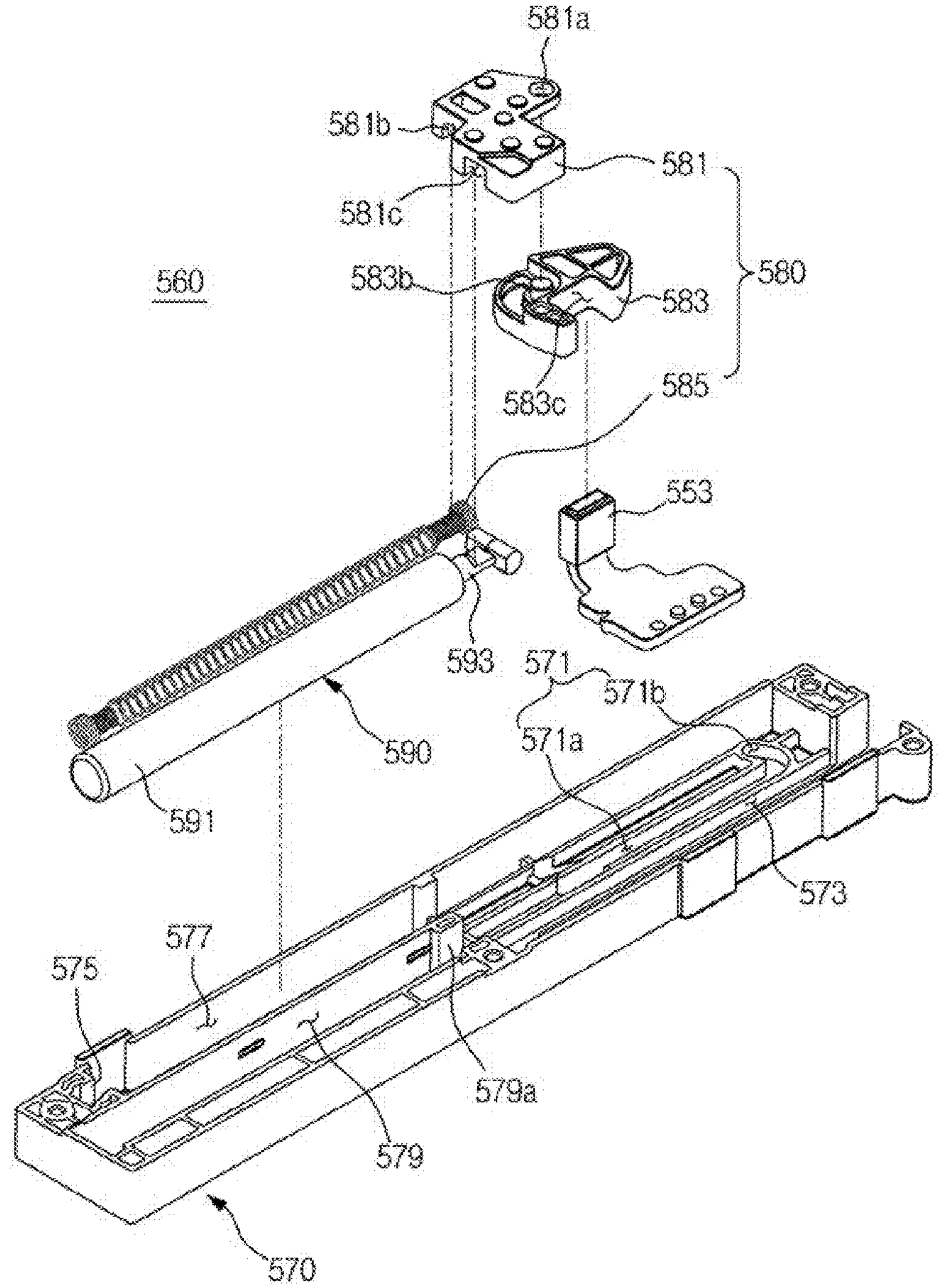
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FIG. 29

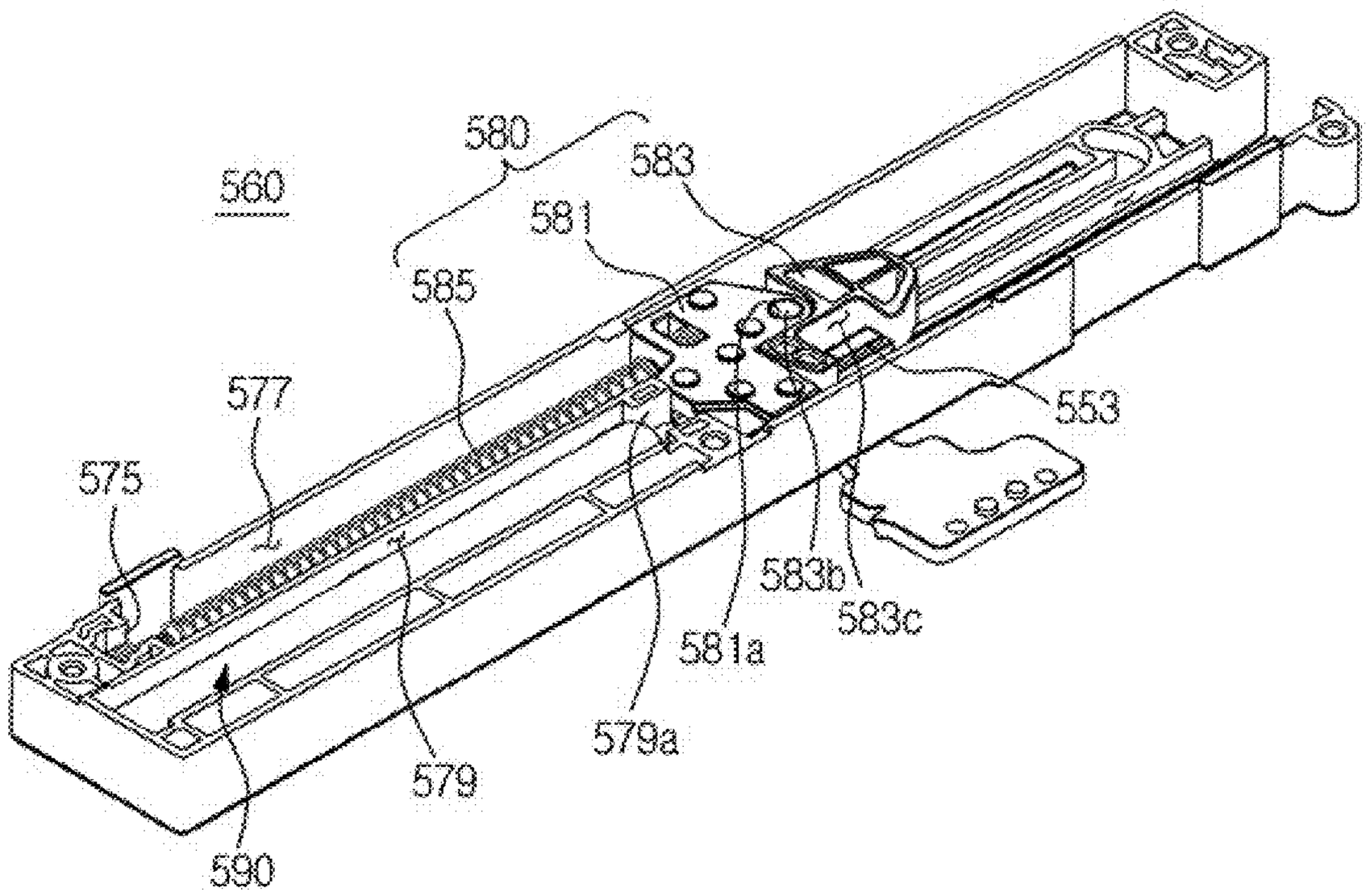


FIG. 30

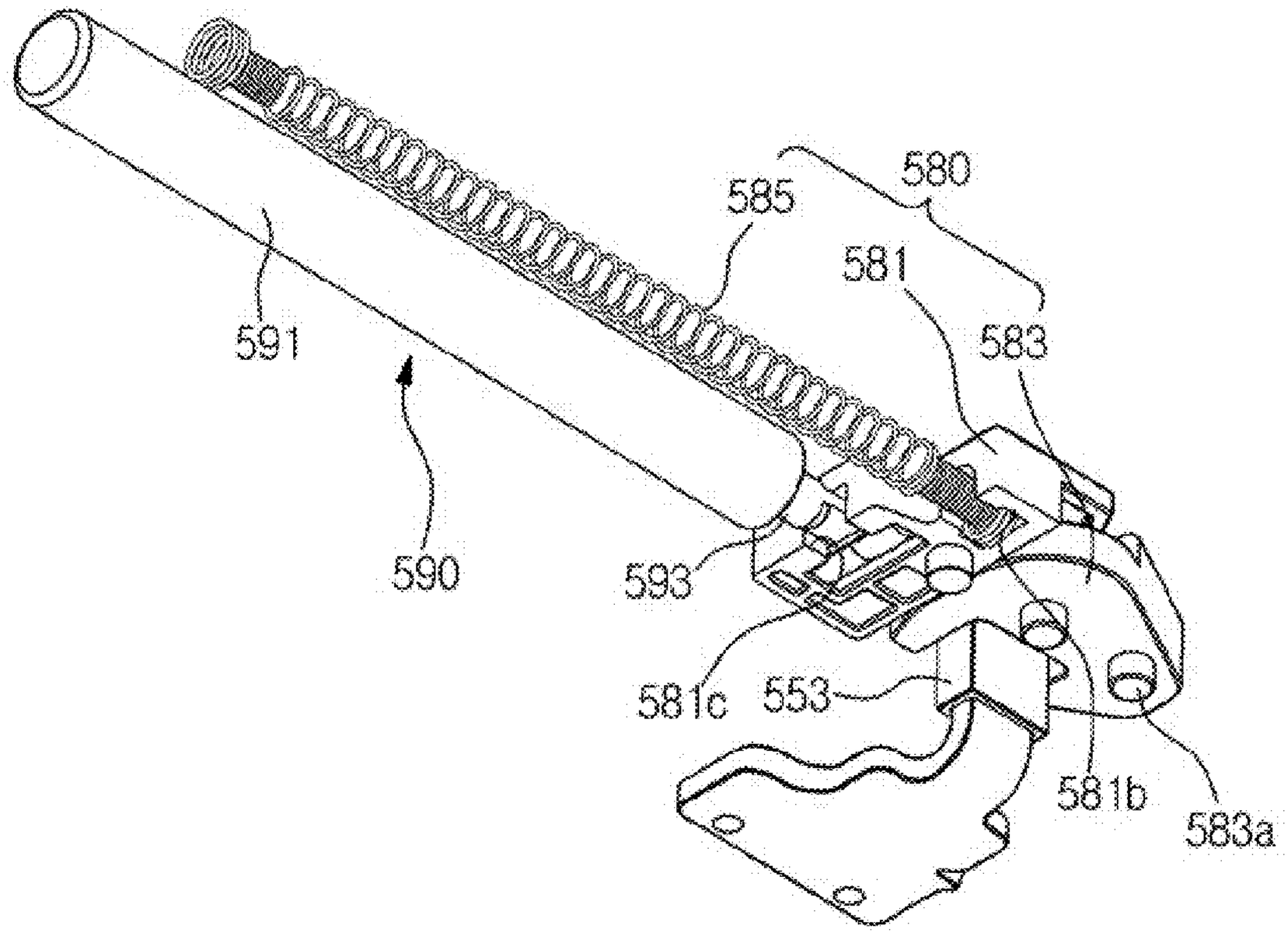


FIG. 31

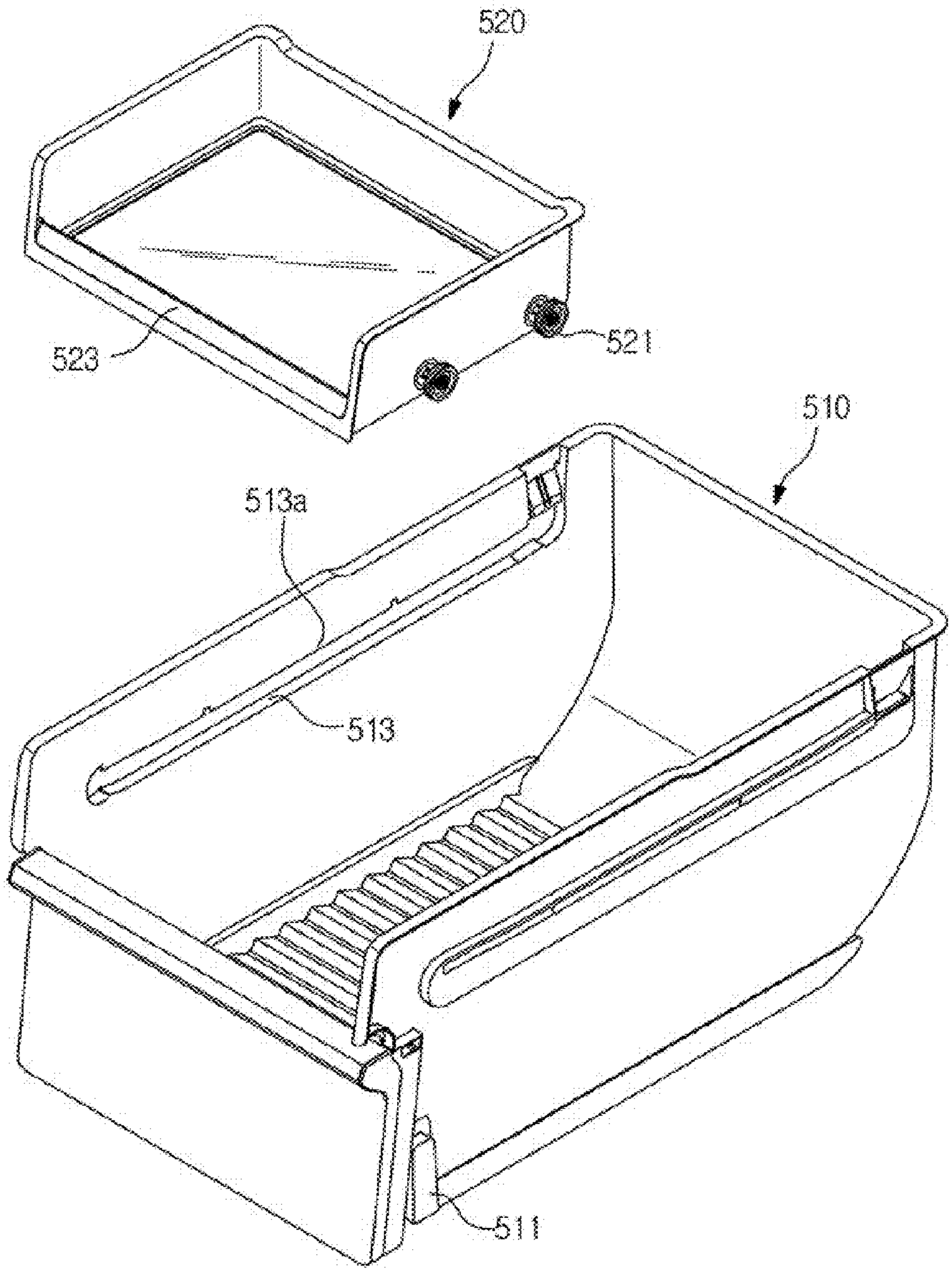


FIG. 32

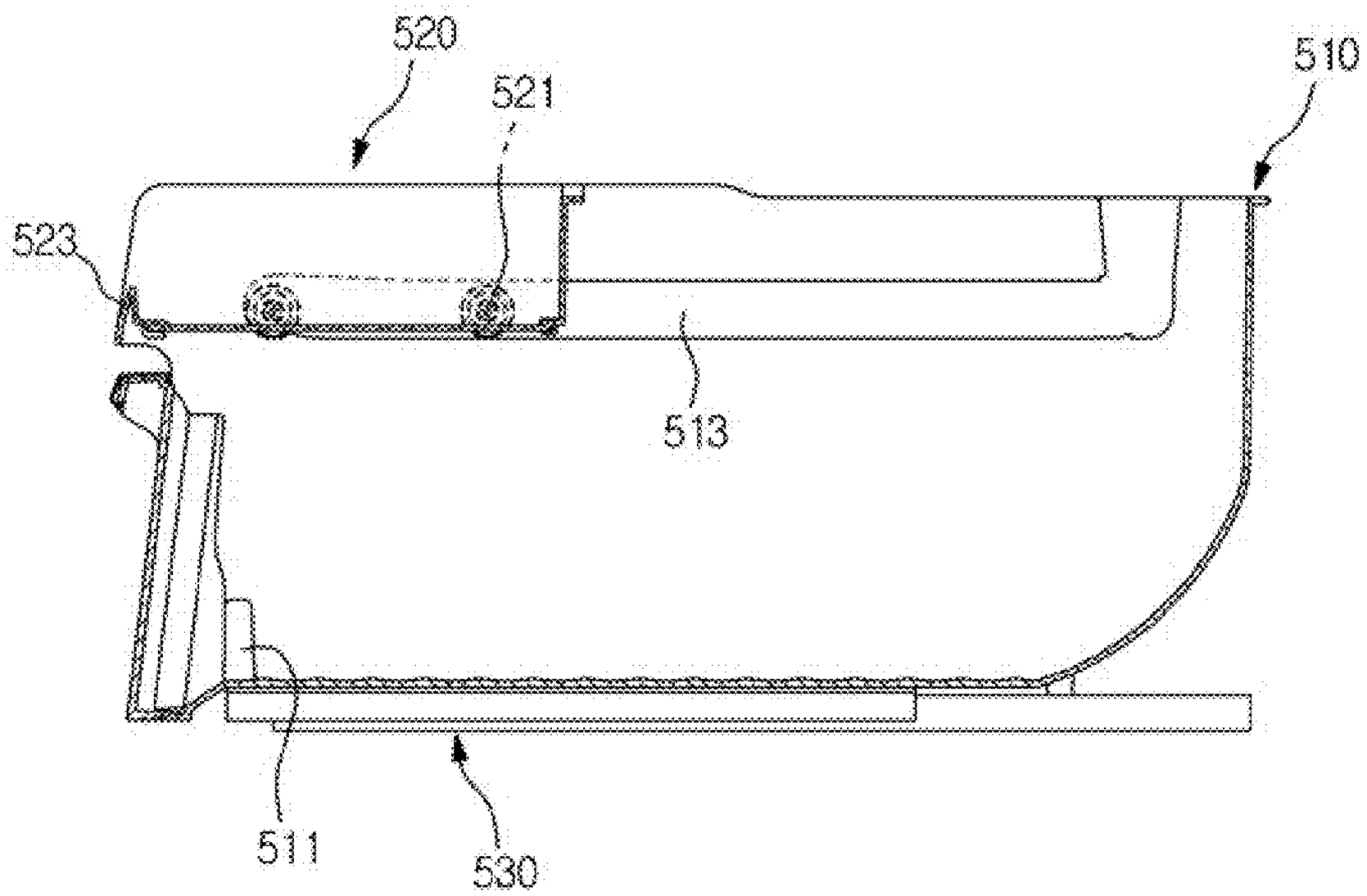


FIG. 33

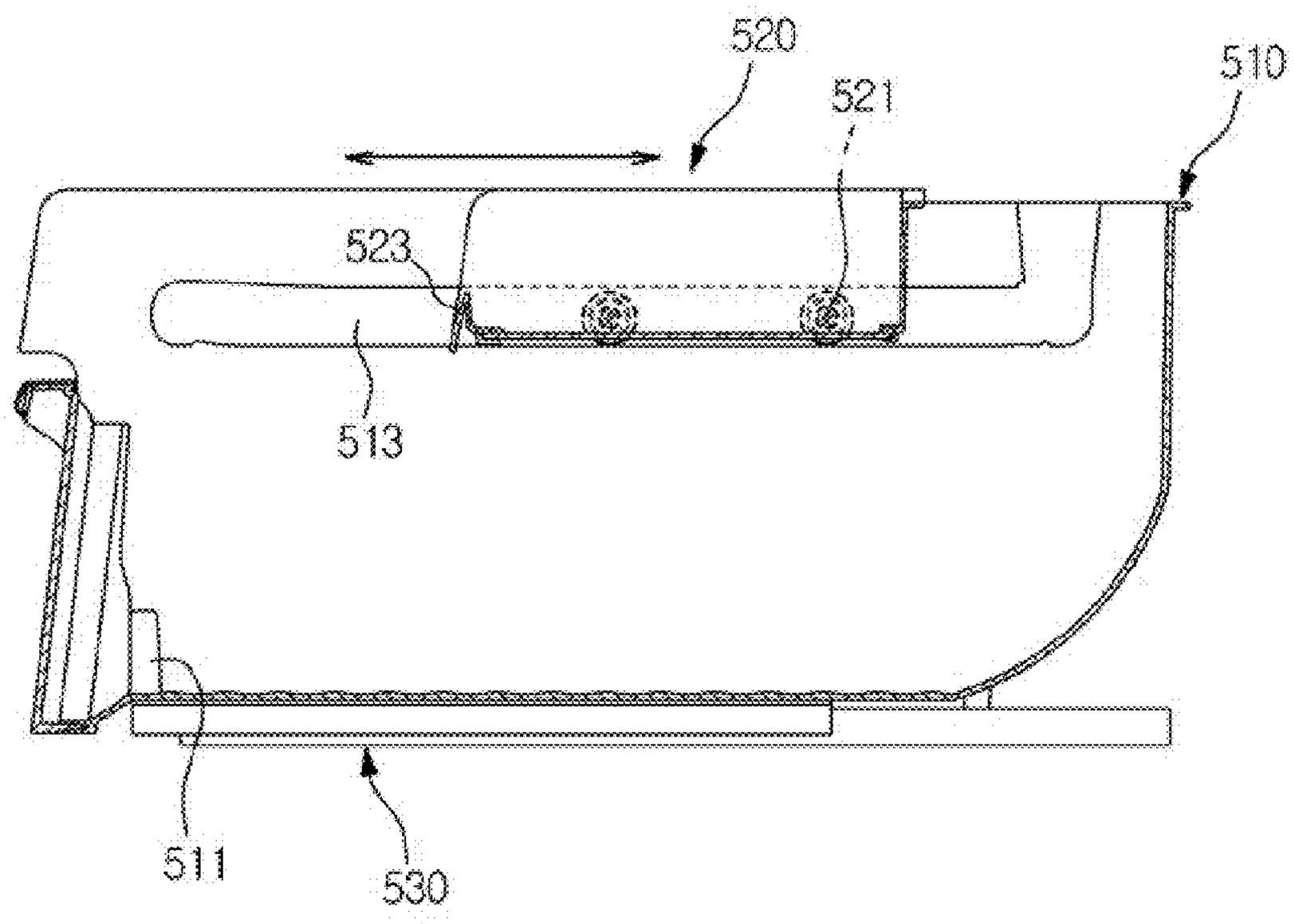


FIG. 34

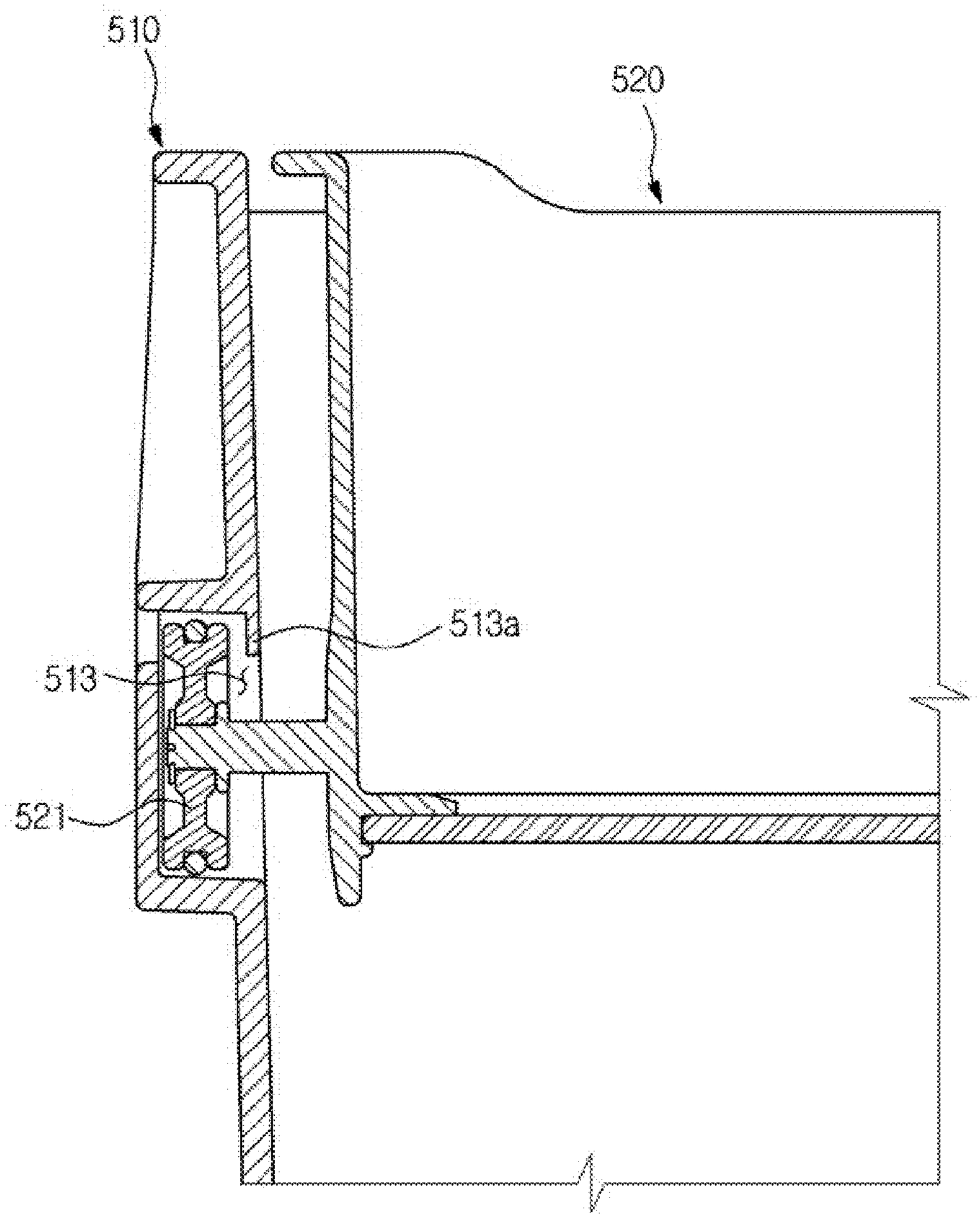


FIG. 35

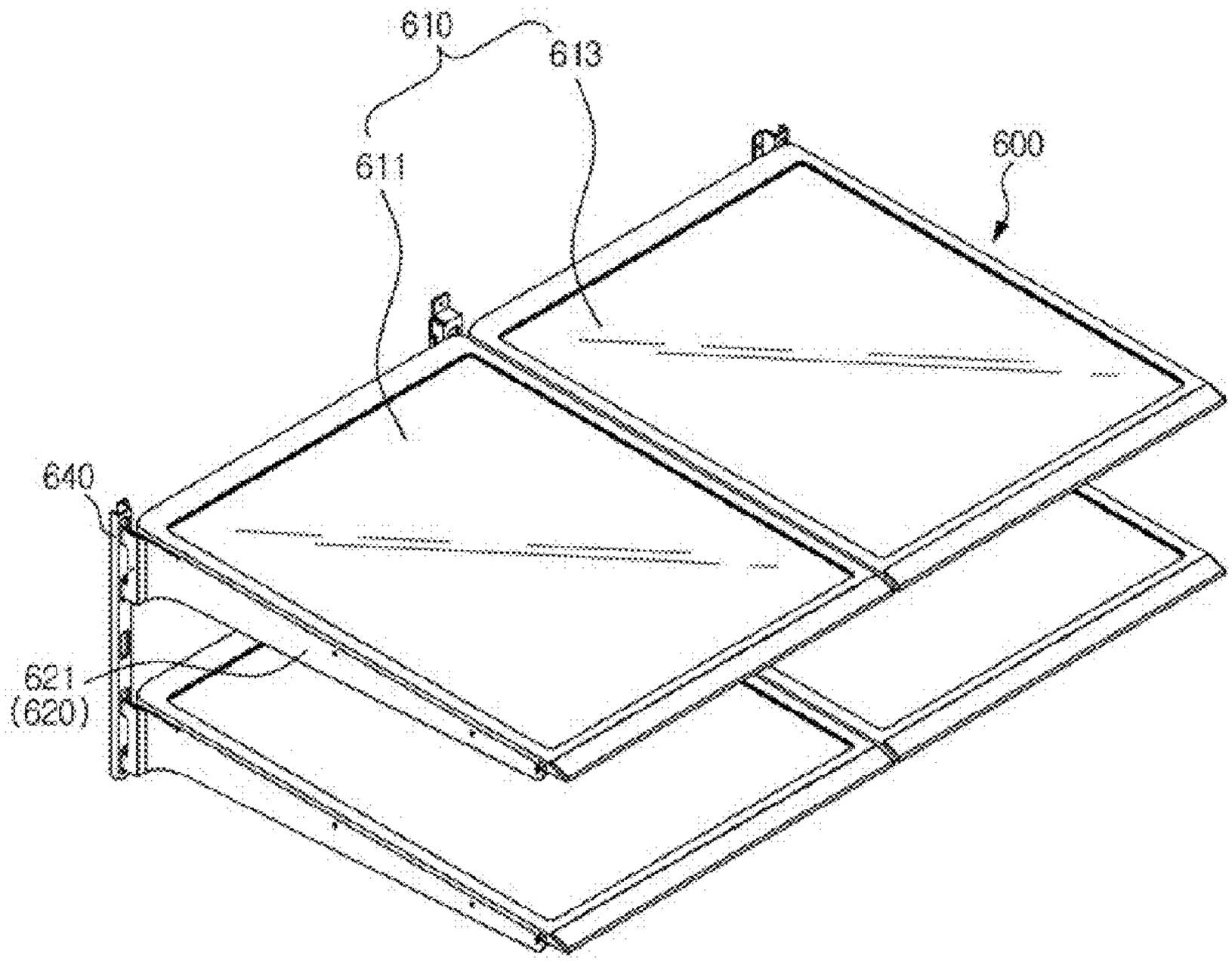
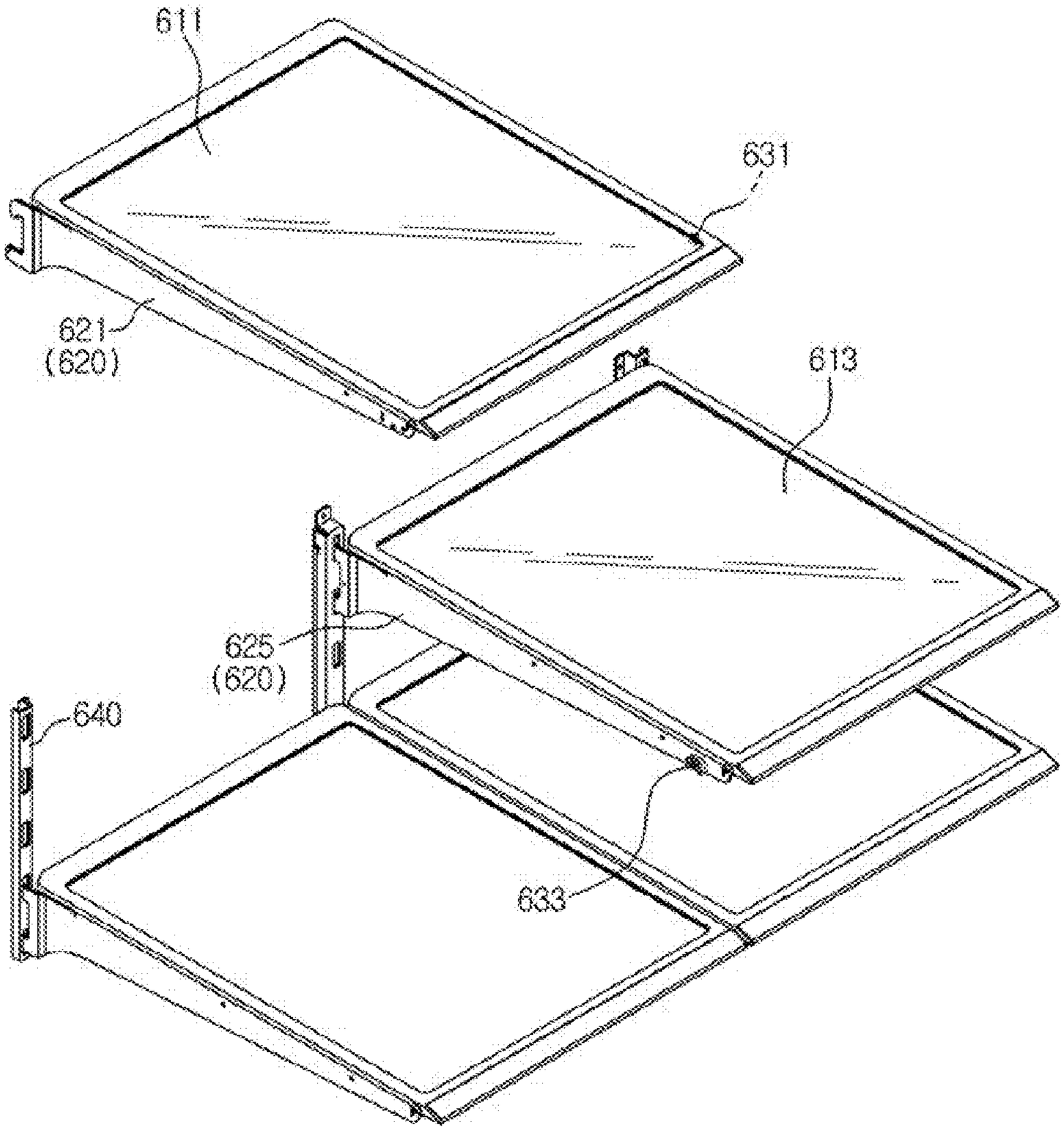


FIG. 36



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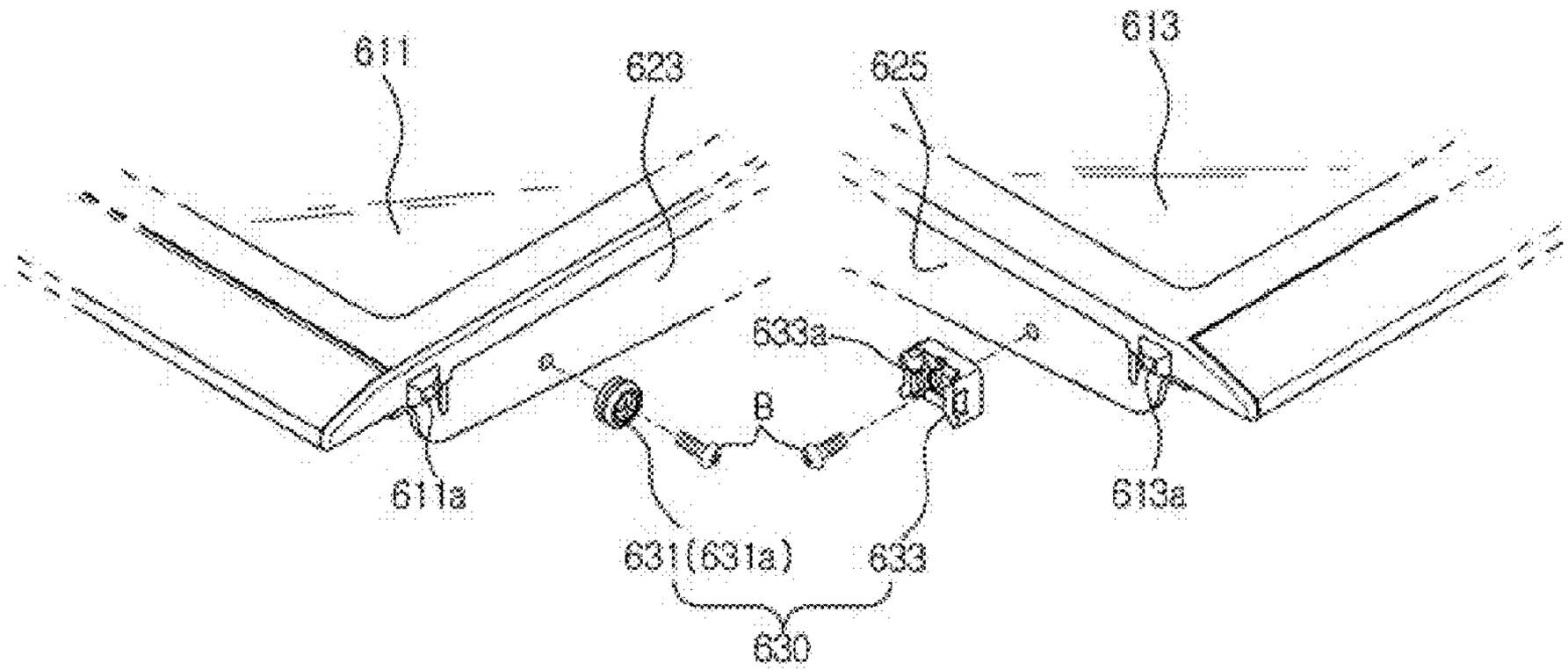


FIG. 38

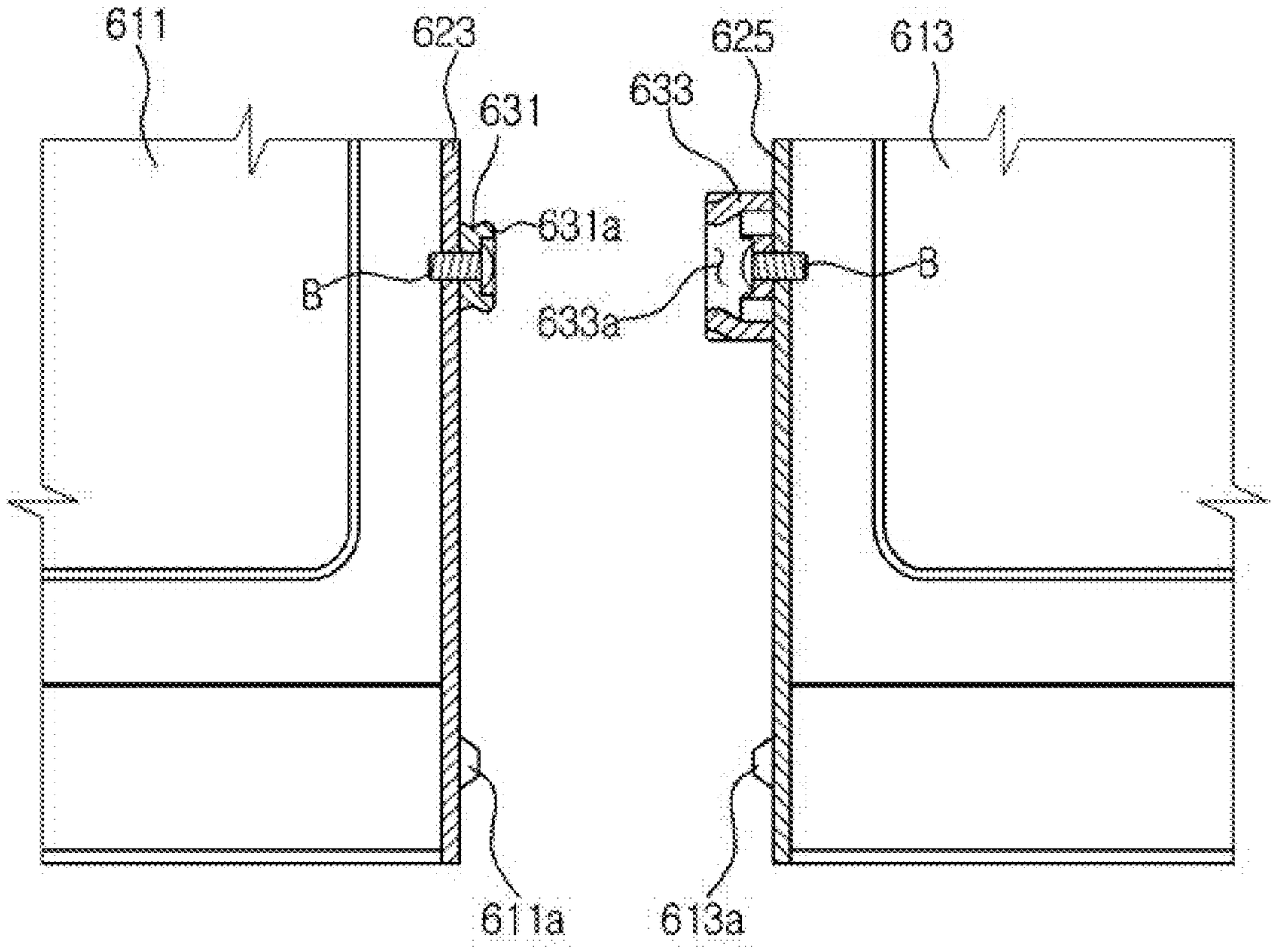


FIG. 39

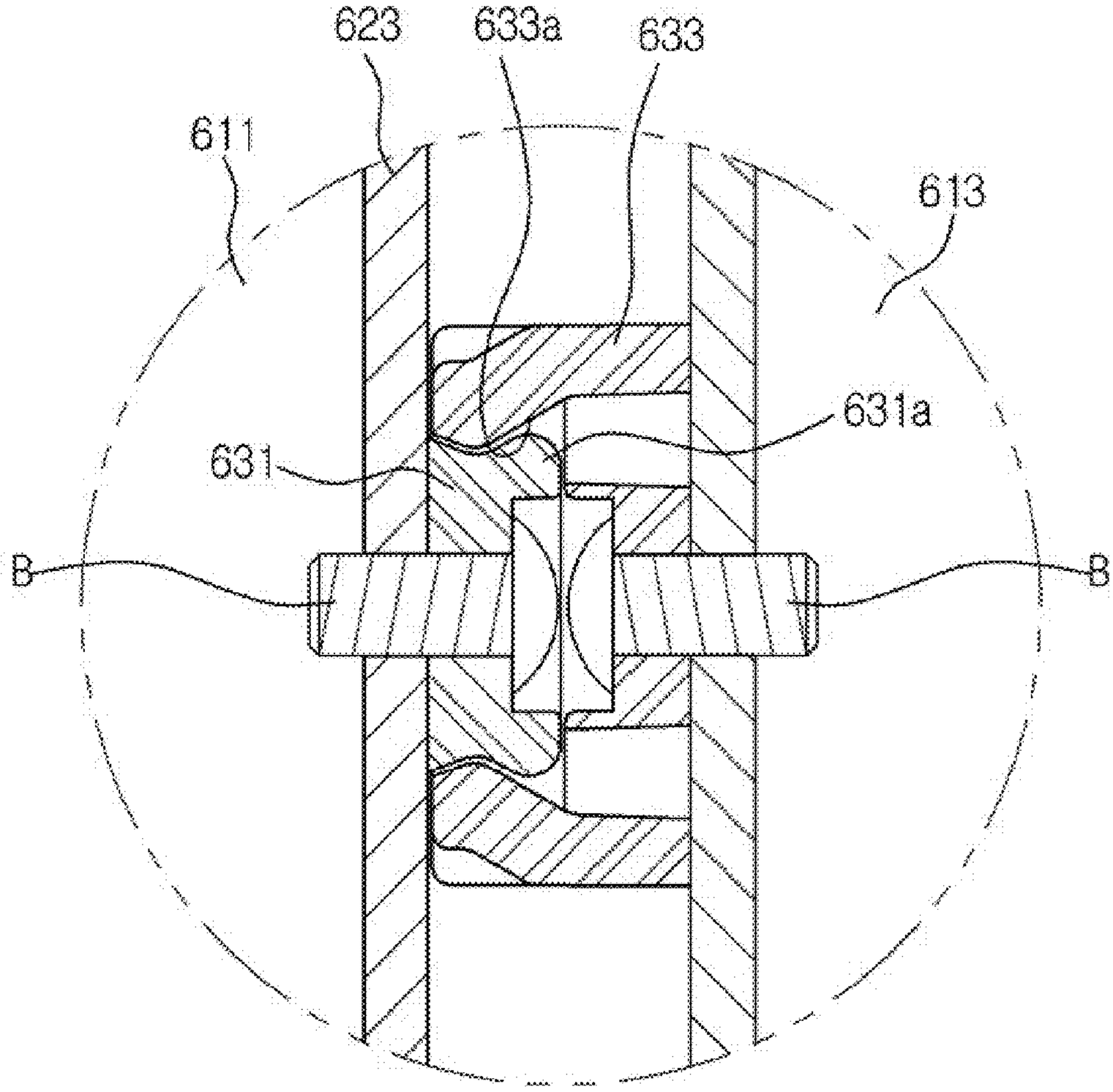


FIG. 40

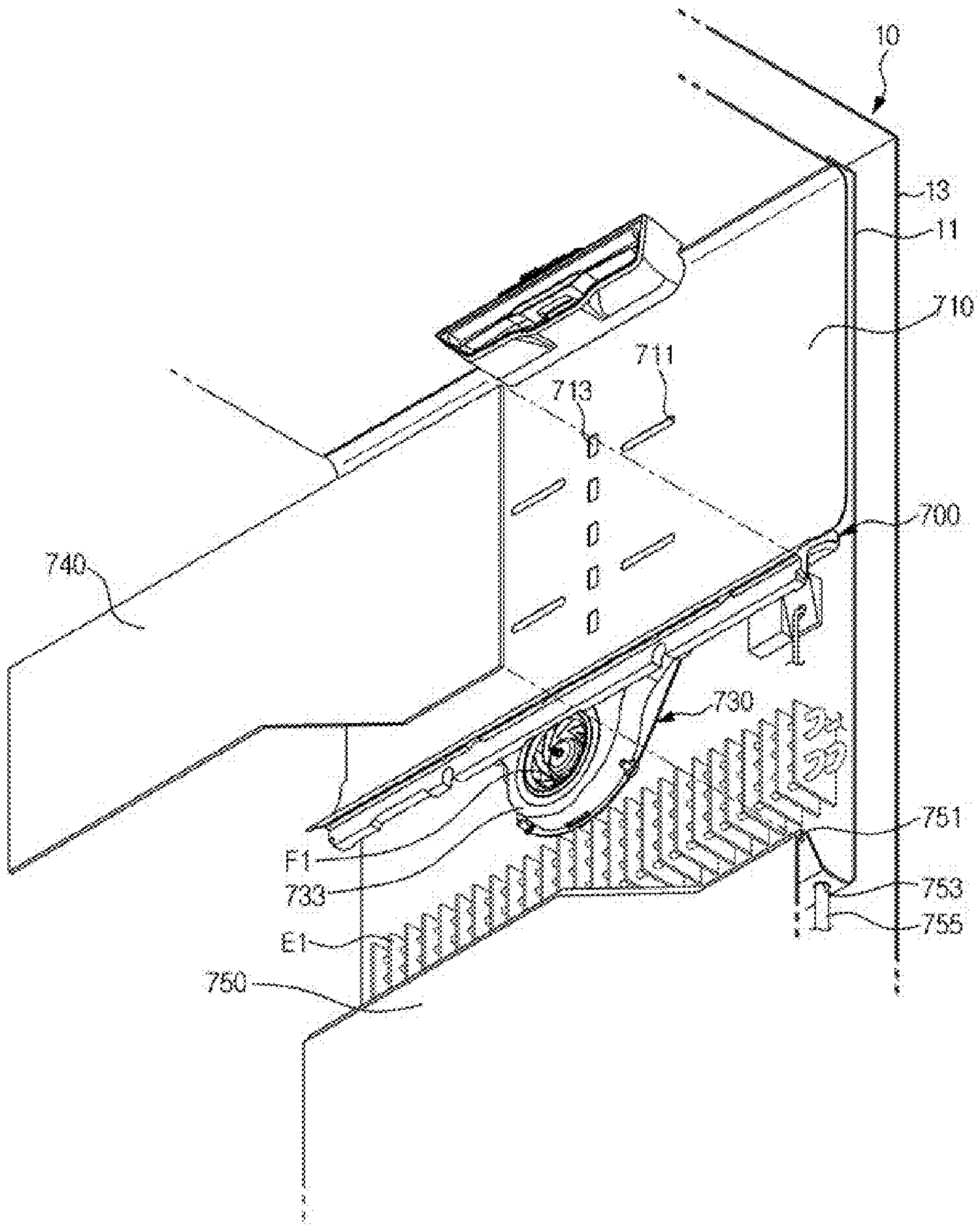


FIG. 41

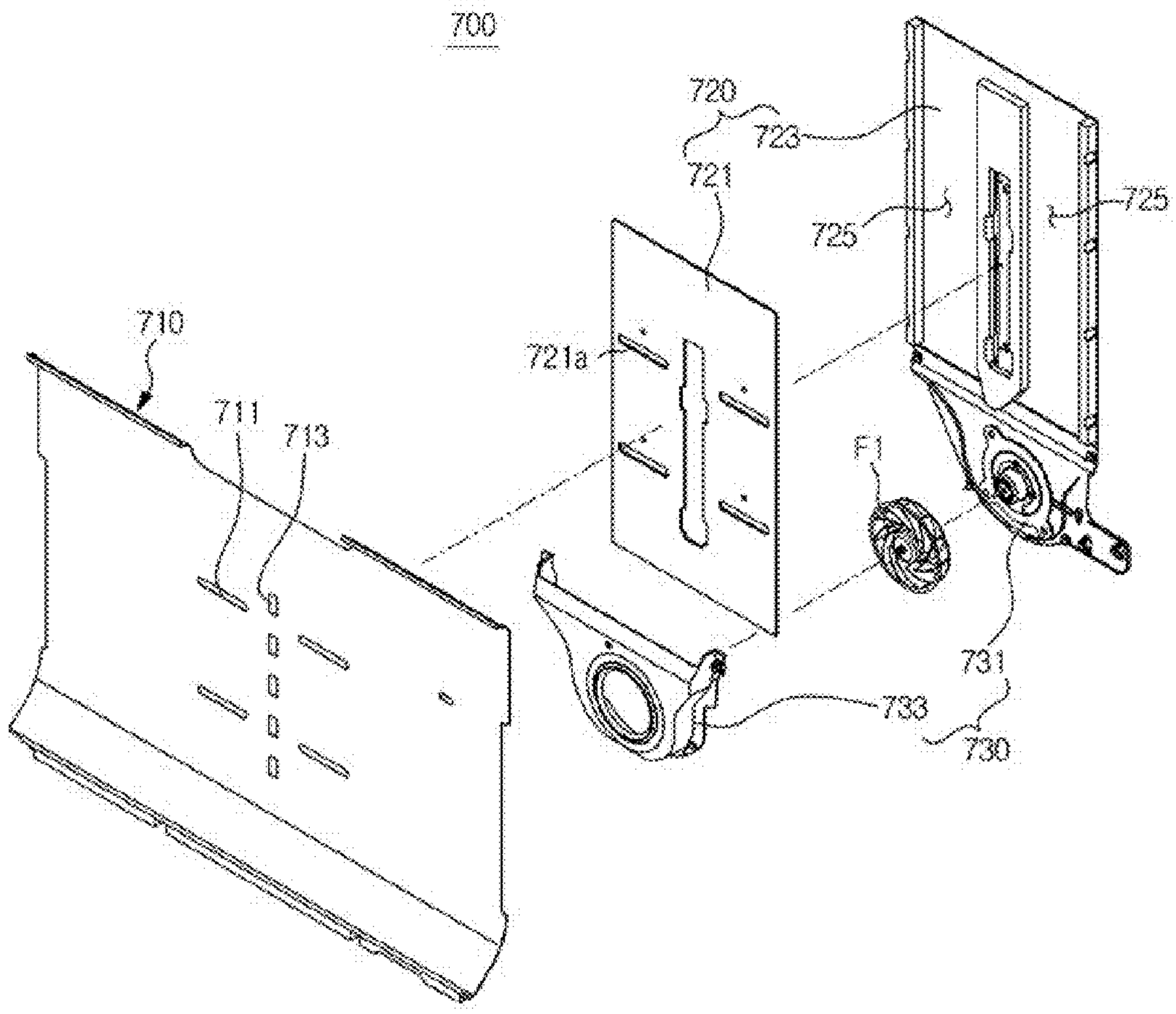


FIG. 42

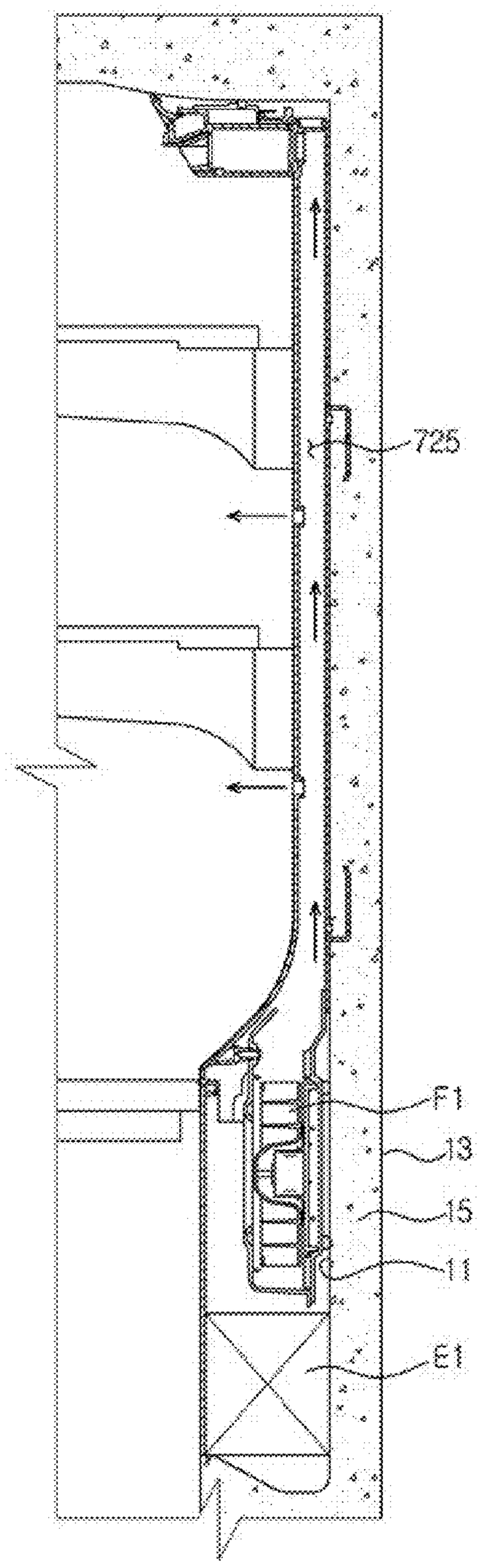


FIG. 43

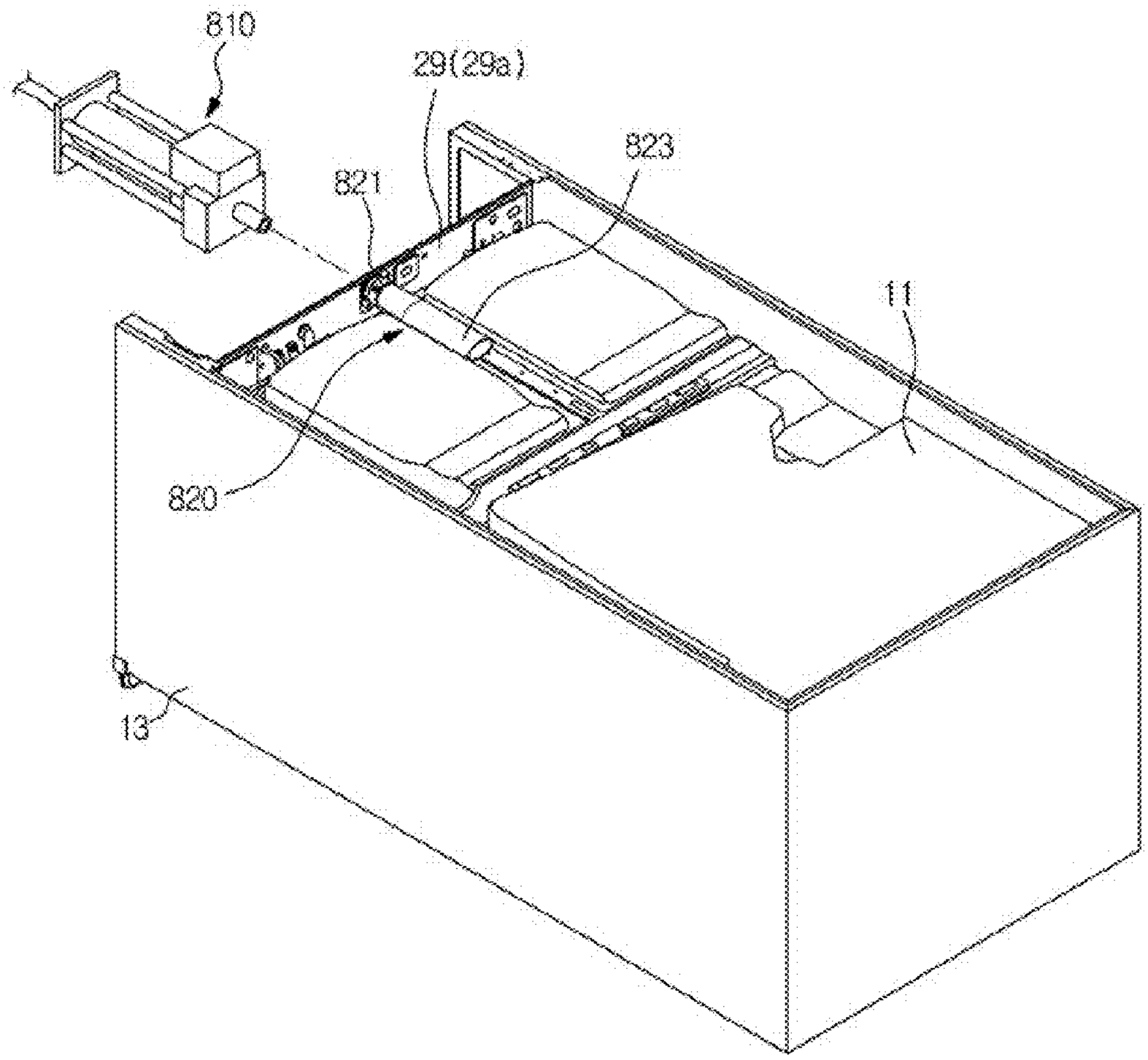


FIG. 44

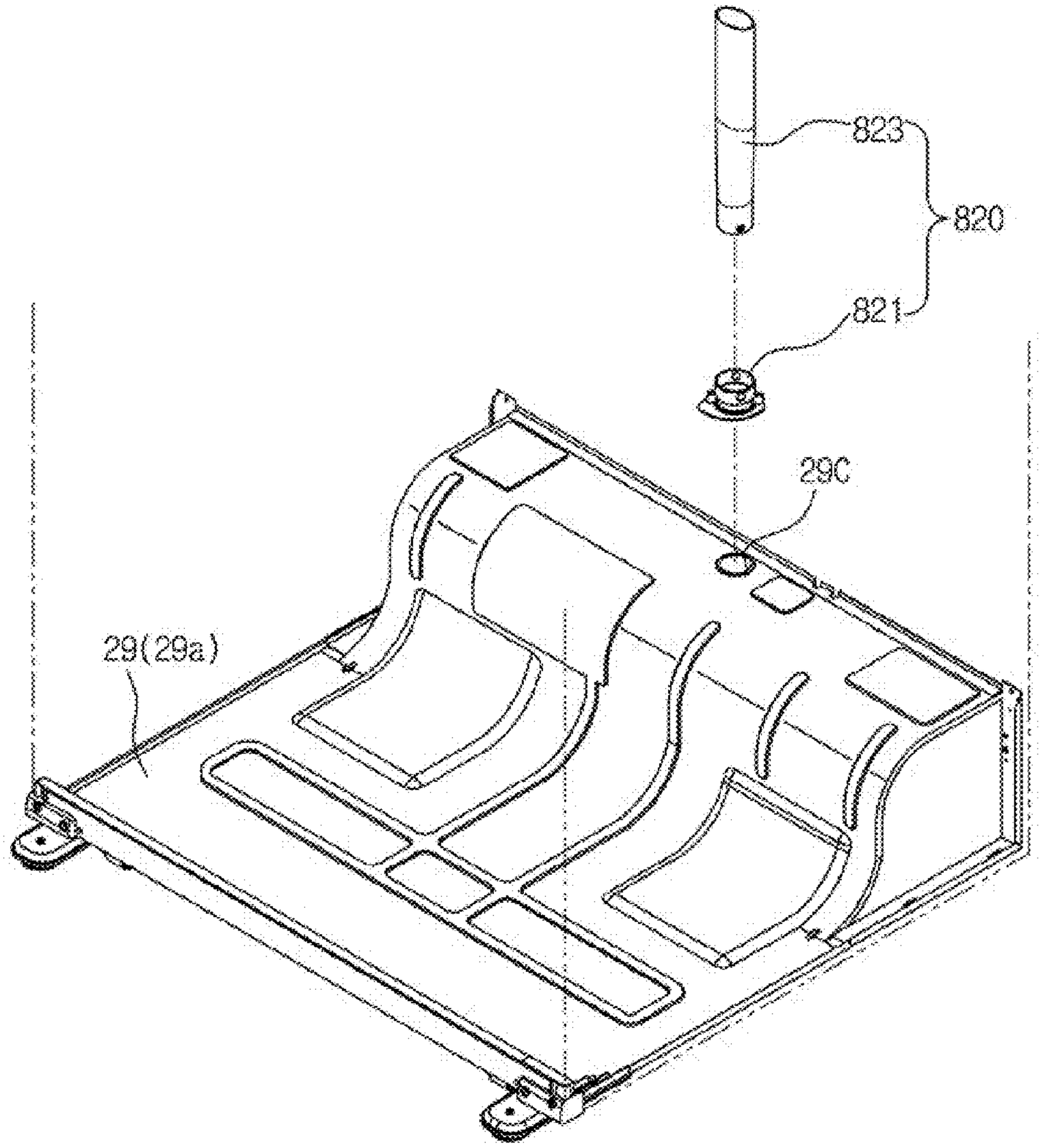


FIG. 45

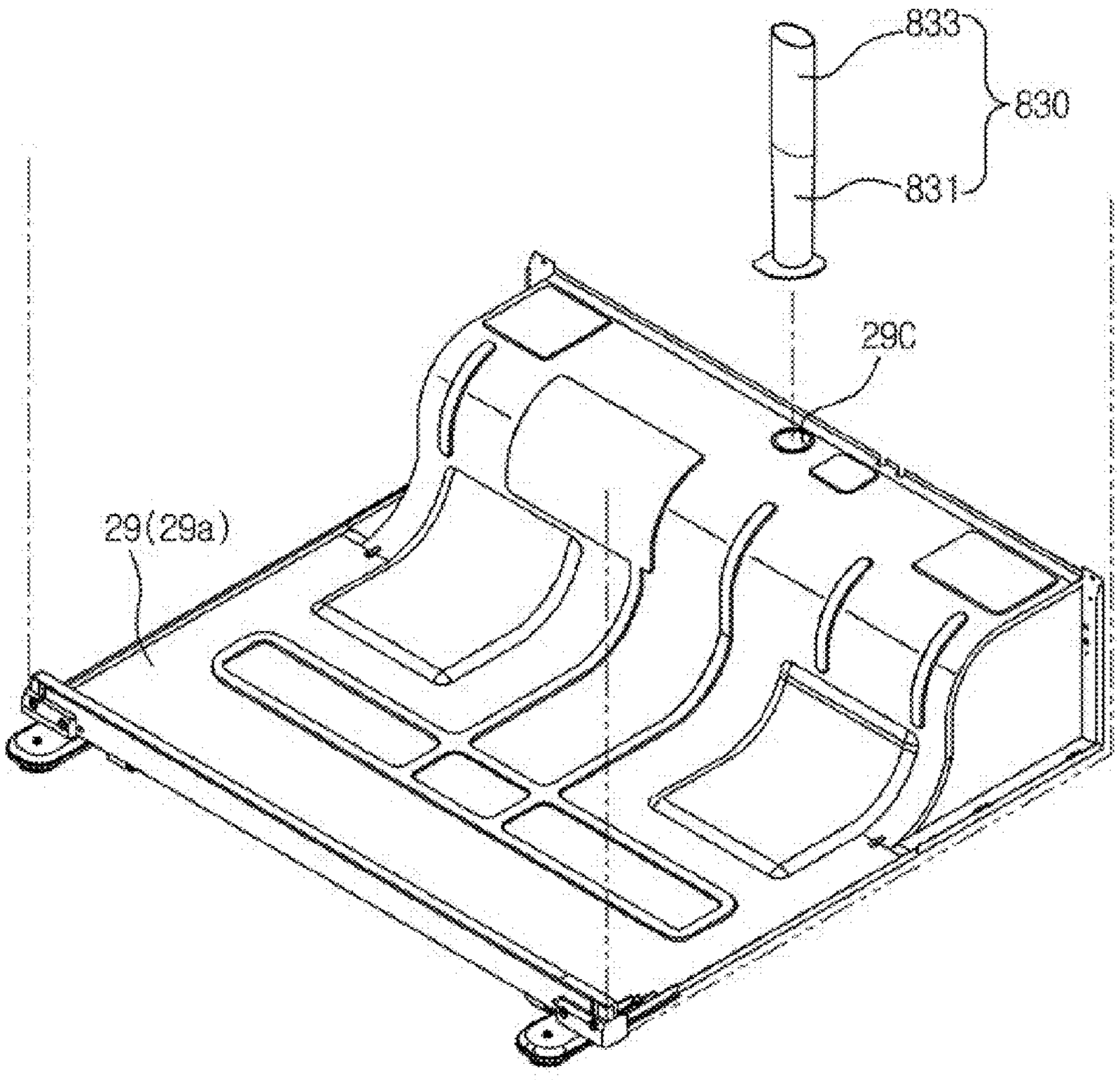


FIG. 46

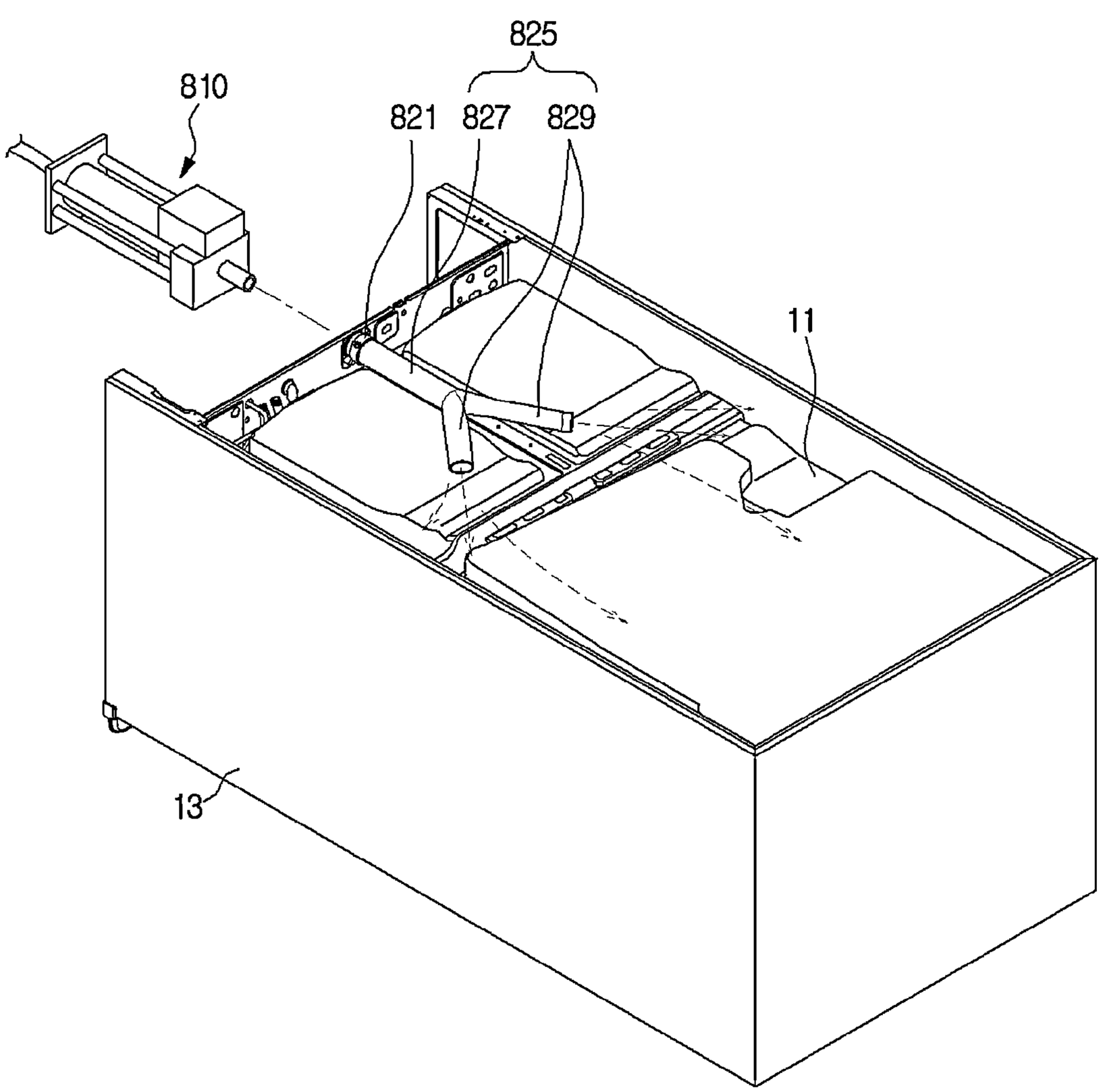


FIG. 47

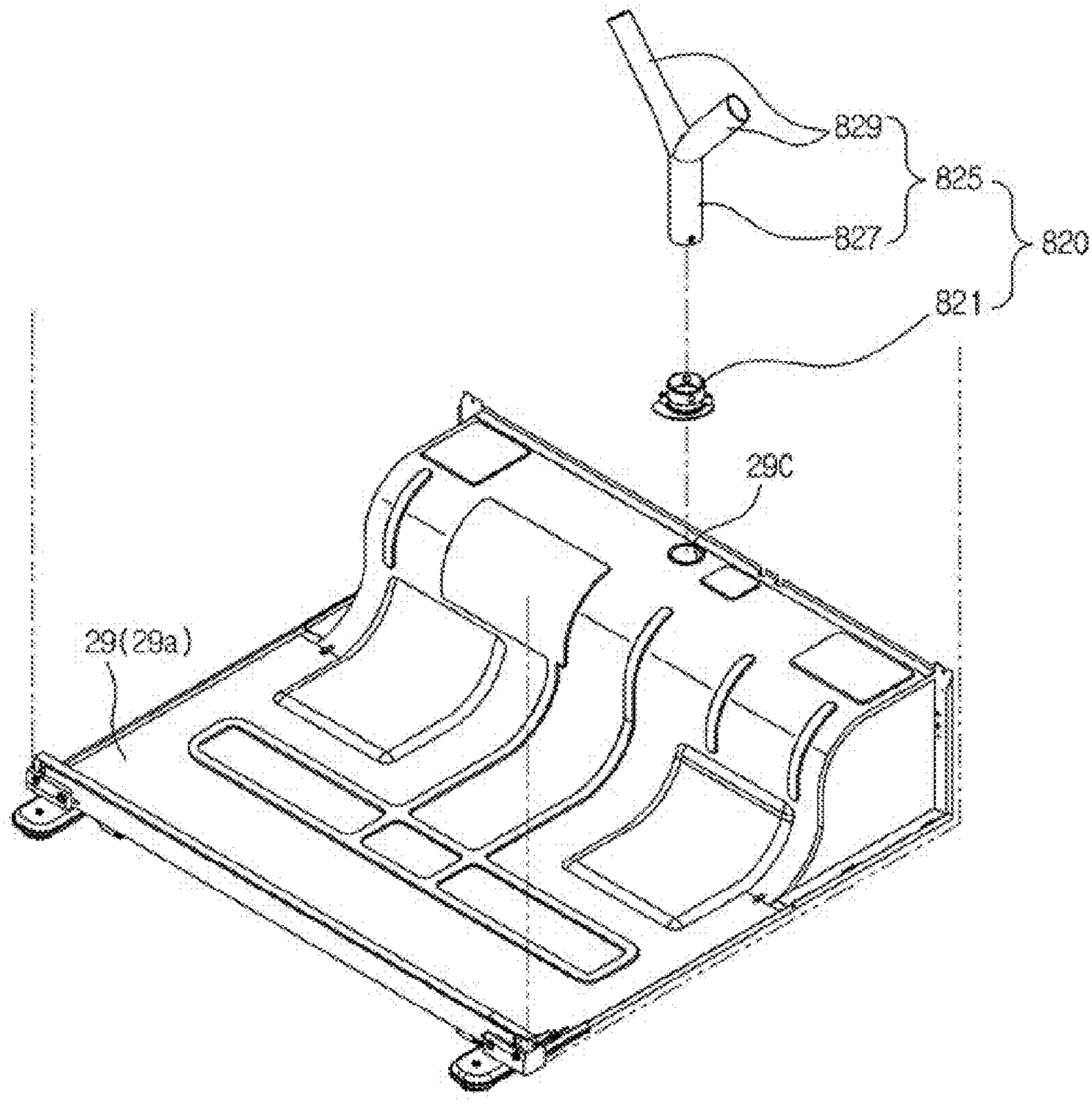


FIG. 48

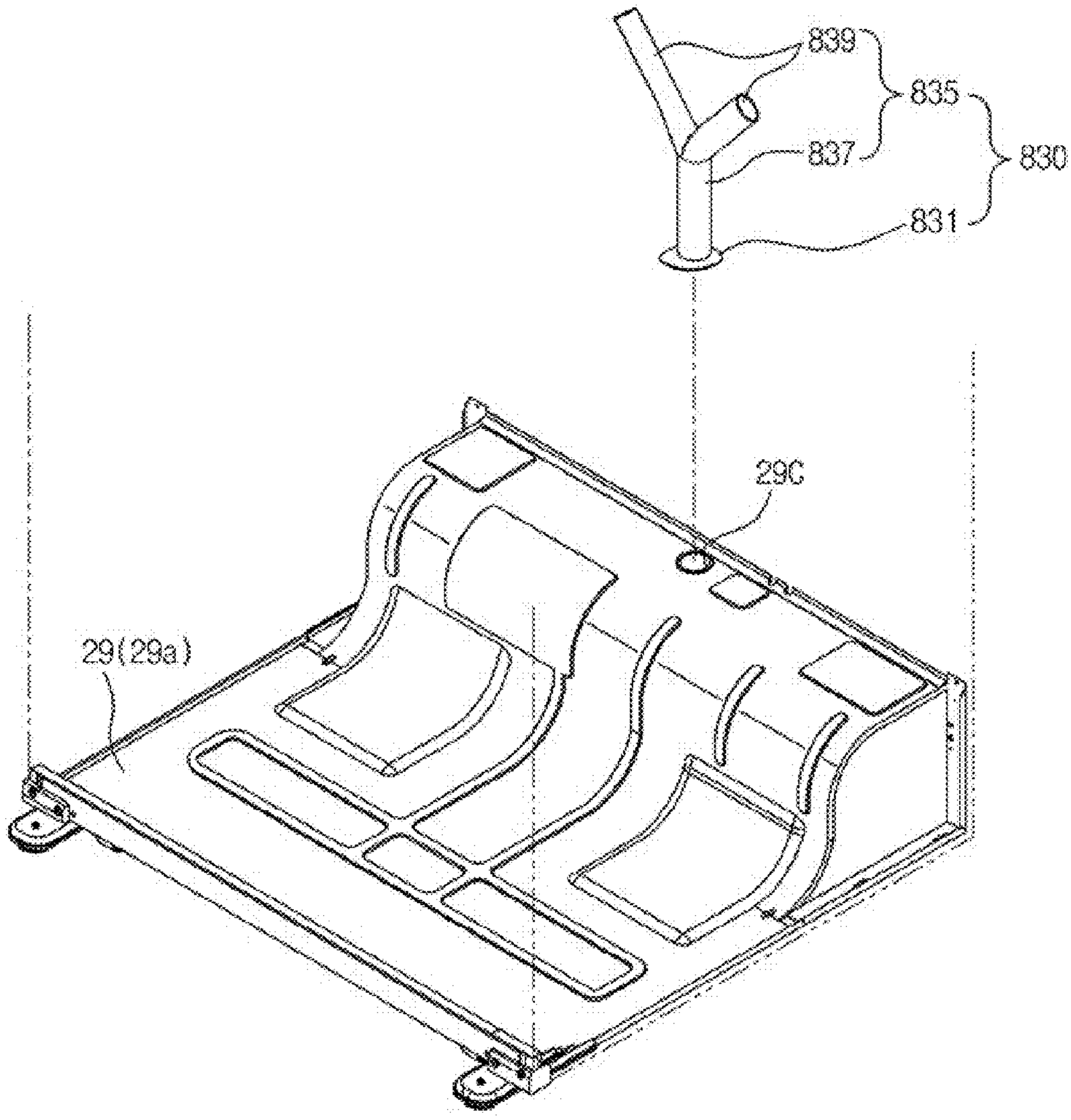
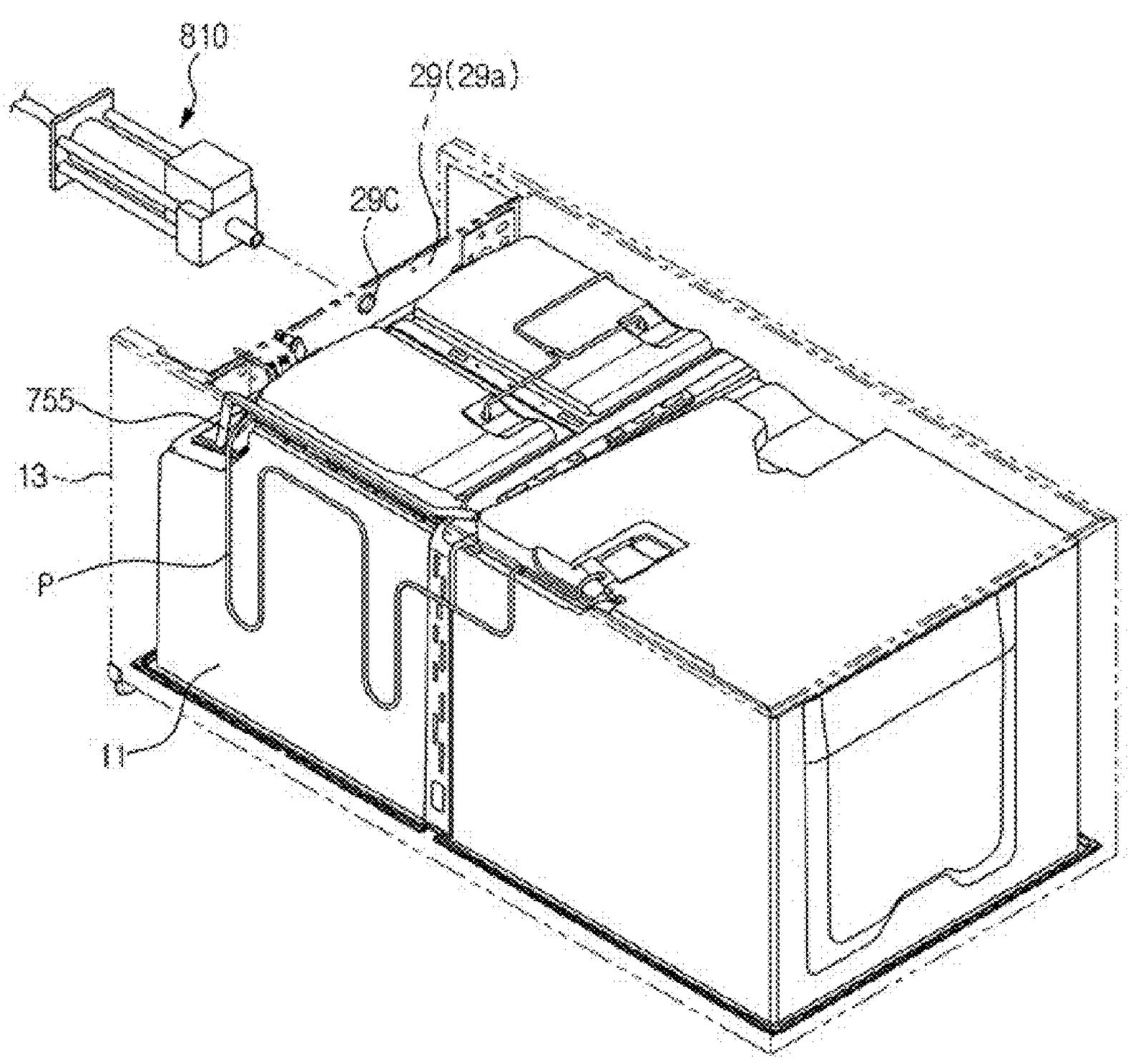


FIG. 49



REFRIGERATOR

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the priority benefit of Korean Patent Application No. 10-2014-0002010 filed on Jan. 7, 2014, and No. 10-2014-0089566 filed on Jul. 16, 2014, respectively, in the Korean Intellectual Property Office, the disclosures of each of which are incorporated herein by reference.

BACKGROUND

1. Field

Embodiments of the disclosure herein relate to a refrigerator that reinforces the strength of a body so as to prevent deformation.

2. Description of the Related Art

In general, a refrigerator refers to a device that keeps food fresh by including a body having an inner case and an outer case, a storage compartment formed by the inner case, and a cold air supplying unit for supplying cold air to the storage compartment.

The storage compartment may be maintained at a temperature in a predetermined range required to keep food fresh.

A front side of the storage compartment of the refrigerator may be disposed to be open, and the open front side of the storage compartment may be closed by a door so that the temperature of the storage compartment may be normally maintained.

An insulating material is foamed between the inner case and the outer case so as to prevent outflow of cold air in the storage compartment.

Since foaming of the insulating material is performed only at a predetermined temperature or higher, heat is generated while the insulating material is foamed. The body has a temperature approximately 20° C. higher than a room temperature in a state in which the insulating material is foamed between the inner case and the outer case.

After the insulating material is foamed between the inner case and the outer case, the temperature of the body is lowered to the room temperature so that the insulating material is solidified and the body thermally contracts.

Since the inner case is mainly formed of a plastic material and the outer case is mainly formed of a steel material and the plastic material has an approximately five times larger quantity of thermal contraction than that of the steel material, when the body thermally contracts, the inner case contracts greatly compared to the outer case and thus, while the temperature of the body is lowered to the room temperature, central parts of both sides of the body are deformed in a convex shape toward an outside of the body. In a state in which the temperature of the body is lowered to the room temperature, the insulating material is solidified in a state in which the central parts of both sides of the body are deformed in the convex shape toward the outside of the body.

When deformation occurs in the inner case and the outer case due to a difference in quantities of thermal contraction of the inner case and the outer case, deformation that occurs in the inner case and the outer case is reduced to a predetermined degree due to the insulating material that contacts the inner case and the outer case. By reducing the thickness of the insulating material foamed between the inner case and the outer case in order to increase an internal capacity of the body having the same exterior size, a quantity of deformation in which the central parts of both sides of the body are deformed in the convex shape toward the outside of the body, is increased by the reduced thickness of the insulating material. Even after the insulating material is foamed, when the refrigerator operates, the temperature of the body is lowered such that the quantity of thermal contraction of the inner case is further increased and a quantity of deformation of the shape is increased.

In addition, when the thickness of the insulating material is reduced, insulation performance may be lowered, and rigidity may be deteriorated such that deformation may occur in the body due to the weight of the body and a load of a material stored in the body.

In order to improve the insulation performance lowered due to the reduced thickness of the insulating material, a vacuum insulating material may be disposed between the inner case and the outer case together with the insulating material. The vacuum insulating material may be disposed between the inner case and the outer case together with the insulating material so as to supplement the lowered insulation performance, but deteriorated rigidity is not supplemented.

SUMMARY

Therefore, it is an aspect of the disclosure to provide a refrigerator that is capable of reducing a quantity of deformation of a body by improving rigidity of the body that is lowered due to a thickness of insulation being reduced to increase an internal capacity of the body, using a reinforcement structure.

It is another aspect of the disclosure to provide a refrigerator in which an electric apparatus box in which electric apparatus components for controlling an operation of the refrigerator are accommodated, is disposed in a hinge cover disposed in the front of an upper portion of a body so that spatial utility may be improved.

It is still another aspect of the disclosure to provide a refrigerator in which, when a fire breaks out in components inside the electric apparatus box, a reinforcement plate formed of a steel material is disposed in the electric apparatus box so as to prevent the fire from being spread toward an outside of the electric apparatus box.

Additional aspects of the disclosure will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of the disclosure.

In accordance with an aspect of the disclosure, there is provided a refrigerator which may include a body including an inner case in which a storage compartment is formed, an outer case that is coupled to an outside of the inner case and constitutes an exterior, and an insulating material foamed between the inner case and the outer case, and a reinforcement member that is disposed between the inner case and the outer case of both sides of the body and prevents deformation of the body, wherein the reinforcement member is attached to the inner case so as to be disposed at both sides of the body in a widthwise direction.

The reinforcement member may include a first reinforcement member disposed at an upper portion of both sides of the body and a second reinforcement member disposed at a lower portion of both sides of the body.

The reinforcement member may be disposed to have a thickness of about 0.5 mm.

The reinforcement member may be disposed to have a cross-section in a shape of unevenness between the inner

case and the outer case, the cross-section having a larger thickness than that of the reinforcement member and a smaller height than a distance between the inner case and the outer case.

In accordance with an aspect of the disclosure, there is provided a refrigerator which may include an inner case in which a storage compartment is formed, an outer case that is coupled to an outside of the inner case and constitutes an exterior, an insulating material foamed between the inner case and the outer case, and a reinforcement member that is disposed between the inner case and the outer case and prevents deformation of the inner case and the outer case that occurs when the insulating material is foamed and then is solidified due to a difference in quantities of thermal contraction of the inner case and the outer case.

The reinforcement member may be disposed to correspond to a direction in which the insulating material is foamed between the inner case and the outer case and flows.

The reinforcement member may be disposed at both sides of the inner case in a widthwise direction and may be attached to the inner case.

The reinforcement member may be disposed at both sides of the outer case in a widthwise direction and may be attached to the outer case.

The reinforcement member may be disposed at both sides of the inner case in a lengthwise direction and may be attached to the inner case.

The reinforcement member may be disposed at both sides of the outer case in a lengthwise direction and may be attached to the outer case.

In accordance with an aspect of the disclosure, there is provided a refrigerator which may include an inner case in which a storage compartment is formed, an outer case that is coupled to an outside of the inner case and constitutes an exterior, an insulating material foamed between the inner case and the outer case, and a reinforcement member that is disposed between the inner case and the outer case so as to be disposed at both sidewalls of the inner case so that deformation that occurs in a lateral direction of the inner case and the outer case when the insulating material is foamed and then is solidified due to a difference in quantities of thermal contraction between the inner case and the outer case, is prevented.

The reinforcement member may be disposed to correspond to a direction in which the insulating material is foamed between the inner case and the outer case and flows.

The reinforcement member may be disposed at both sides of the inner case in a widthwise direction and may be attached to the inner case or outer case using an adhesive.

The reinforcement member may be disposed at both sides of the inner case in a lengthwise direction and may be attached to the inner case or outer case using an adhesive.

The reinforcement member may be disposed to have a thickness of about 0.5 mm and may be formed of steel.

The reinforcement member may be disposed to have a cross-section having an uneven shape, the cross-section having a larger thickness than a thickness of the reinforcement member and a smaller height than a distance between the inner case and the outer case.

The refrigerator may further include a reinforcement frame disposed at a front side of the refrigerator to supplement rigidity of the body, the reinforcement frame including at least one of an upper reinforcement frame coupled to an upper portion of the front side of the inner case, an intermediate reinforcement frame coupled to a central portion of the front side of the inner case, a lower reinforcement frame coupled to a lower portion of the front side of the inner case, and a side reinforcement frame coupled to a lower side portion of the front side of the inner case.

In accordance with an aspect of the disclosure, there is provided a refrigerator including an inner case in which a storage compartment is formed, an outer case that is coupled to an outside of the inner case and constitutes an exterior, an insulating material disposed between the inner case and the outer case, and a reinforcement member disposed in the insulating material between the inner case and the outer case at a side of the body, and being attached to one of the inner case and the outer case. A portion of the reinforcement member may be attached to a side surface of one of the inner case and the outer case, and a portion of the reinforcement member may be bent away from the side surface of the one of the inner case and the outer case.

The refrigerator may further include a vacuum insulation panel disposed between the inner case and the outer case together with the insulating material, wherein the reinforcement member may be attached to the side surface of the inner case and may be bent away from the side surface of the inner case toward the vacuum insulation panel.

The reinforcement member may include a first reinforcement member disposed at an upper portion of the side of the body and a second reinforcement member disposed at a lower portion of the side of the body, and the first reinforcement member and the second reinforcement member may each be disposed in a widthwise direction of the side of the body and each have a length in the widthwise direction which is less than a length of the side of the body in the widthwise direction.

The reinforcement member may be disposed in a lengthwise direction of the side of the body and may have a length in the lengthwise direction which is less than a length of the side of the body in the lengthwise direction.

The refrigerator may further include a reinforcement frame disposed at a front side of the refrigerator to supplement rigidity of the body, the reinforcement frame including at least one of an upper reinforcement frame coupled to an upper portion of the front side of the inner case, an intermediate reinforcement frame coupled to a central portion of the front side of the inner case, a lower reinforcement frame coupled to a lower portion of the front side of the inner case, and a side reinforcement frame coupled to a lower side portion of the front side of the inner case.

BRIEF DESCRIPTION OF THE DRAWINGS

These and/or other aspects of the disclosure will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

FIG. **1** is a perspective view of a refrigerator according to an embodiment of the disclosure;

FIG. **2** is a cross-sectional view of a side of the refrigerator according to an embodiment of the disclosure;

FIG. **3** is a cross-sectional view of a front side of the refrigerator according to an embodiment of the disclosure;

FIG. **4** is a view of a state in which a reinforcement member according to an embodiment of the disclosure is attached to an inner case;

FIG. **5** is a cross-sectional view of a state in which a first reinforcement member according to an embodiment of the disclosure is attached to the inner case;

FIG. **6** is a view of a state in which the reinforcement member according to an embodiment of the disclosure is attached to an outer case;

FIG. **7** is a view of a state in which the reinforcement member according to an embodiment of the disclosure is attached to the inner case in a lengthwise direction;

FIG. **8** is a view of a state in which a reinforcement frame according to an embodiment of the disclosure is coupled to a body;

FIG. **9** is a perspective view of the reinforcement frame according to an embodiment of the disclosure;

FIG. **10** is an exploded perspective view of an electric apparatus box disposed on the refrigerator according to an embodiment of the disclosure;

FIG. **11** is an exploded perspective view of a state in which the electric apparatus box according to an embodiment of the disclosure is viewed in an upward direction;

FIG. **12** is a perspective view of the electric apparatus box according to an embodiment of the disclosure;

FIG. **13** is a cross-sectional view of a state in which the electric apparatus box according to an embodiment of the disclosure is disposed at the body;

FIG. **14** is a view of wires connected to the electric apparatus box according to an embodiment of the disclosure;

FIG. **15** is a schematic view of a state in which a heating pipe according to an embodiment of the disclosure is disposed at the body;

FIG. **16** is a view of the outer case and the inner case in which the heating pipe according to an embodiment of the disclosure is disposed;

FIG. **17** is a view of a state in which the heating pipe is fixed to the inner case according to an embodiment of the disclosure;

FIG. **18** is a view of a state in which a mounting portion for mounting the heating pipe and a fixing groove for fixing the heating pipe are disposed at the inner case according to an embodiment of the disclosure;

FIG. **19** is a view of a state in which the heating pipe according to an embodiment of the disclosure is disposed at the body;

FIG. **20** is a view of a state in which a storage unit is disposed in a storage compartment according to an embodiment of the disclosure;

FIG. **21** is a view of a state in which a sliding shelf according to an embodiment of the disclosure is coupled to an inside of the storage compartment;

FIG. **22** is a view of a state in which the sliding shelf according to an embodiment of the disclosure has been coupled to the inside of the storage compartment;

FIG. **23** is a view of a state in which a first storage box is coupled to the sliding shelf according to an embodiment of the disclosure;

FIG. **24** is an enlarged view of a portion in which a cover rail of FIG. **23** is coupled to a coupling portion;

FIG. **25** is a view of a state in which the sliding shelf is coupled to the first storage box according to an embodiment of the disclosure;

FIG. **26** is a view of a state in which the sliding shelf according to an embodiment of the disclosure is viewed from a bottom;

FIG. **27** is a view of a state in which a sliding portion is taken out from the sliding shelf of FIG. **26**;

FIG. **28** is an exploded perspective view of a self closing unit according to an embodiment of the disclosure;

FIG. **29** is a view of the self closing unit according to an embodiment of the disclosure;

FIG. **30** is a view of a state in which a part of the self closing unit according to an embodiment of the disclosure is viewed from the bottom;

FIG. **31** is a view of a state in which a first storage box and a second storage box according to an embodiment of the disclosure are separated from each other;

FIG. **32** is a view of a state in which a storage unit according to an embodiment of the disclosure is viewed from a side;

FIG. **33** is a view of a state in which the second storage box is moved in FIG. **32**;

FIG. **34** is a view of a state in which the second storage box is disposed in the first storage box according to an embodiment of the disclosure;

FIG. **35** is a view of a shelf unit according to an embodiment of the disclosure;

FIG. **36** is a view of a state in which a first shelf is separated from a support portion in FIG. **35**;

FIG. **37** is a view of a state in which a horizontal maintaining portion according to an embodiment of the disclosure is coupled to a bracket;

FIG. **38** is a view of a state in which the horizontal maintaining portion according to an embodiment of the disclosure is coupled to a shelf according to an embodiment of the disclosure;

FIG. **39** is a view of a state in which a fixing protrusion according to an embodiment of the disclosure is inserted into a fixing groove;

FIG. **40** is a view of an inside of an upper storage compartment according to an embodiment of the disclosure;

FIG. **41** is an exploded perspective view of a first cold air duct according to an embodiment of the disclosure;

FIG. **42** is a view of a state in which the first cold air duct is disposed at the refrigerator according to an embodiment of the disclosure;

FIG. **43** is a view of a state in which a straight guide member is disposed at the refrigerator according to an embodiment of the disclosure;

FIG. **44** is a view of a state in which the straight guide member of FIG. **43** is coupled to an insulating material inlet disposed in a machine compartment cover;

FIG. **45** is a view of a state in which a guide member according to an embodiment of FIG. **44** is coupled to the insulating material inlet disposed in the machine compartment cover;

FIG. **46** is a view of a state in which a Y-shaped guide member is disposed at the refrigerator according to an embodiment of the disclosure;

FIG. **47** is a view of a state in which the Y-shaped guide member of FIG. **46** is coupled to the insulating material inlet disposed in the machine compartment cover;

FIG. **48** is a view of a state in which a guide member according to an embodiment of FIG. **47** is coupled to the insulating material inlet disposed in the machine compartment cover; and

FIG. **49** is a view of a state in which a refrigerant pipe and a drainage pipe according to an embodiment of the disclosure are disposed at a side of the body.

DETAILED DESCRIPTION

Reference will now be made in detail to the embodiments of the disclosure, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

Hereinafter, embodiments of the disclosure will be described in detail with reference to the attached drawings.

As illustrated in FIGS. **1** through **3**, a refrigerator may include a body **10**, a plurality of storage compartments **20** configured in the body **10** in such a way that a front side of

each of the plurality of storage compartments **20** is open, one or more doors **30** that is pivotally coupled to the body **10** so as to open/close the open front side of each of the storage compartments **20**, and a hinge unit **40** (see FIG. **10**) that causes the door **30** to be pivotally coupled to the body **10**.

The body **10** may include an inner case **11** that constitutes each storage compartment **20**, an outer case **13** that constitutes an exterior, and a cold air supplying unit that supplies cold air to the storage compartment **20**.

The cold air supplying unit may include a compressor C, a condenser (not shown), an expansion valve (not shown), one or more evaporators E (e.g. E**1**, E**2**), one or more blower fans F (e.g., F**1**, F**2**), and a cold air duct D. An insulating material **15** may be foamed between the inner case **11** and the outer case **13** of the body **10** so as to prevent outflow of the cold air of the storage compartment **20**.

The compressor C, the condenser (not shown), the expansion valve (not shown), and the evaporator E may be connected to one another using a refrigerant pipe P, and a refrigerant may be guided via the refrigerant pipe P.

A machine compartment **28** in which the compressor C and the condenser (not shown) in which the refrigerant is compressed and the compressed refrigerant is condensed, are installed, may be disposed at a lower side of the rear of the body **10**.

The evaporator E may include a first evaporator E**1** that supplies the cold air to an upper storage compartment **21** that will be described below and a second evaporator E**2** that supplies the cold air to a lower storage compartment **23**. The cold air generated by the first evaporator E may be supplied to the upper storage compartment **21** via a first blower fan F**1**, and the cold air generated by the second evaporator E**2** may be supplied to the lower storage compartment **23** via a second blower fan F**2**.

The cold air duct D may include a first cold air duct **700** that is disposed at a rear side of the upper storage compartment **21** and forms a first flow path **725** on which the cold air generated by the first evaporator E**1** is supplied to the upper storage compartment **21** via the first blower fan F**1**, and a second cold air duct **760** that is disposed at a rear side of the lower storage compartment **23** and forms a second flow path **763** on which the cold air generated by the second evaporator E**2** is supplied to the lower storage compartment **23** via the second blower fan F**2**.

A first cold air outlet **711** may be disposed at the first cold air duct **700** so that the cold air generated by the first evaporator E**1** may be supplied to the upper storage compartment **21** via the first cold air outlet **711**. A second cold air outlet **761** may be disposed at the second cold air duct **760** so that the cold air generated by the second evaporator E**2** may be supplied to the lower storage compartment **23** via the second cold air outlet **761**.

The storage compartment **20** may be partitioned by a partition **17** into a plurality of parts. The partition **17** may include a first partition **17***a* that partitions off the storage compartment **20** into the upper storage compartment **21** and the lower storage compartment **23** and a second partition **17***b* that partitions off the lower storage compartment **23** into a left storage compartment **25** and a right storage compartment **26**.

The upper storage compartment **21** of the upper storage compartment **21** and the lower storage compartment **23** that are partitioned off by the first partition **17***a*, may be used as a refrigeration compartment, and the lower storage compartment **23** may be partitioned off by the second partition **17***b* into the left storage compartment **25** and the right storage compartment **26** so that the left storage compartment **25** may be used as a freezer compartment and the right storage compartment **26** may be used as both the freezer compartment and the refrigeration compartment.

Partitioning of the storage compartment **20** described above is merely one example. Each of the storage compartments **21**, **25**, and **26** may be used in a different manner from the above-described configuration. For example, there may only be one partition which divides the storage compartment **20** into upper and lower halves, or one partition which divides the storage compartment **20** into left and right halves, or there may be more than two partitions which divide the storage compartment **20** into more than three storage compartments.

A plurality of shelf units **600** may be disposed in the storage compartment **20** so that the storage compartment **20** may be partitioned off into a plurality of parts. A plurality of storage containers **27** in which food may be stored, may be disposed in the plurality of parts of the storage compartment **20**.

The open front side of the storage compartment **20** may be open/closed by the door **30** that is pivotally coupled to the body **10**, and a plurality of door guards **31** in which food may be accommodated, may be installed at a rear side of the door **30**.

The hinge unit **40** that causes the door **30** to be pivotally coupled to the body **10** may include an upper hinge **41** (see FIG. **10**) coupled to an upper portion of the body **10**, an intermediate hinge **43** coupled to the first partition **17***a*, and a lower hinge (not shown) coupled to a lower portion of the body **10**.

As illustrated in FIGS. **1** through **3**, urethane may be mainly used as the insulating material **15** foamed between the inner case **11** and the outer case **13** of the body **10**, and foaming of the insulating material **15** may be performed only at a predetermined temperature or higher.

Since foaming of the insulating material **15** may be performed only at the predetermined temperature or higher, heat is generated while the insulating material **15** is foamed. Thus, in a state in which the insulating material **15** is foamed between the inner case **11** and the outer case **13**, the body **10** has a temperature approximately 20° C. higher than a room temperature.

After the insulating material **15** is foamed between the inner case **11** and the outer case **13**, the temperature of the body **10** may be lowered to the room temperature so that the insulating material **15** is solidified and the body **10** thermally contracts.

For example, where the inner case **11** is mainly formed of a plastic material, the outer case **13** is mainly formed of a steel material, and the plastic material has an approximately five times larger quantity of thermal contraction than that of the steel material, when the body **10** thermally contracts, the inner case **11** contracts more greatly than the outer case **13**. Thus, while the temperature of the body **10** is lowered to the room temperature, central parts of both sides of the body **10** are deformed in a convex shape toward an outside of the body **10**, and in a state in which the temperature of the body **10** is lowered to the room temperature, the insulating material **15** is solidified in a state in which the central parts of both sides of the body **10** are deformed in the convex shape toward the outside of the body **10**.

Also, in order to increase an internal capacity of the body **10** having the same exterior size, the thickness of the insulating material **15** foamed between the inner case **11** and the outer case **13** need to be reduced. In order to supplement lowered insulation performance caused by the reduced

thickness of the insulating material **15**, a vacuum insulating material **19** may be disposed between the inner case **11** and the outer case **13**.

The vacuum insulating material **19** may also be disposed in the insulating material **15** foamed between the inner case **11** and the outer case **13** of the body **10** and may also be disposed in the insulating material **15** foamed in the door **30**, in the insulating material **15** foamed in the partition **17**, or in the insulating material **15** foamed between a machine compartment cover **29** and the inner case **11**.

When deformation occurs in the inner case **11** and the outer case **13** due to a difference in quantities of thermal contraction of the inner case **11** and the outer case **13**, the deformation that occurs in the inner case **11** and the outer case **13** may be reduced by the insulating material **15** that contacts the inner case **11** and the outer case **13** to a predetermined degree. When the thickness of the insulating material **15** is reduced, a quantity of deformation in which the central parts of both sides of the body **10** are deformed in the convex shape toward the outside of the body **10**, is increased by the reduced thickness of the insulating material **15**. Even after the insulating material **15** is foamed, when the refrigerator operates, the temperature of the body **10** may be lowered such that the quantity of thermal contraction of the inner case **11** may be further increased and a quantity of deformation of the shape may be increased.

Thus, in order to prevent deformation of the shape that occurs due to the difference in the quantities of thermal contraction of the inner case **11** and the outer case **13** when the temperature of the body **10** is lowered to the room temperature after the insulating material **15** is foamed between the inner case **11** and the outer case **13**, a reinforcement member **100** may be disposed at both sides of the body **10**, as illustrated in FIGS. **4** and **5**.

The reinforcement member **100** may be formed of a metal material (e.g., a steel material). The reinforcement member **100** may be disposed in the insulating material **15** between the inner case **11** and the outer case **13** on one or at both sides of the body **10** and may prevent deformation of the shape that occurs due to the difference in the quantities of thermal contraction of the inner case **11** and the outer case **13** due to rigidity of the reinforcement member **100**.

For example, the reinforcement member **100** may be disposed at both sides of the body **10** in a widthwise direction or a lengthwise direction according to a direction in which the insulating material **15** foamed between the inner case **11** and the outer case **13** flows.

When the insulating material **15** is foamed between the inner case **11** and the outer case **13** and flows in a direction from a rear side of the body **10** to a front side of the body **10**, the reinforcement member **100** may be disposed at both sides of the body **10** in the widthwise direction.

When the reinforcement member **100** is disposed at both sides of the body **10** in the widthwise direction, the reinforcement member **100** may include a first reinforcement member **110** disposed at an upper portion of the first partition **17***a* based on the first partition **17***a* that partitions off the storage compartment **20** into the upper storage compartment **21** and the lower storage compartment **23** and a second reinforcement member **120** disposed at a lower portion of the first partition **17***a*, for example, as shown in FIG. **4**. The first reinforcement member **110** and the second reinforcement member **120** may be positioned at a distance from the edge of the front side of the body **10** and at a distance from the edge of the rear side of the body **10**. For example, the first reinforcement member **110** and the second reinforcement member **120** may be positioned centrally in the widthwise direction (i.e., in a direction to/from the rear side of the body **10** from/to the front side of the body **10**).

The first reinforcement member **110** and the second reinforcement member **120** may be attached to the inner case **11** between the inner case **11** and the outer case **13**, as illustrated in FIG. **4** and may be attached to the outer case **13**, as illustrated in FIG. **6**.

If the first reinforcement member **110** and the second reinforcement member **120** are disposed only in the insulating material **15** between the inner case **11** and the outer case **13**, it does not matter that the first reinforcement member **110** and the second reinforcement member **120** are attached to any one of the inner case **11** and the outer case **13**.

The first reinforcement member **110** disposed at the upper portion of the body **10** has a smaller length than a length of both sides of the body **10** in a forward/backward direction and may be disposed to have a thickness T**1** of about 0.5 mm.

The first reinforcement member **110** may have a maximum height H**1** between the inner case **11** and the outer case **13** so as to increase a cross-sectional coefficient in a direction in which shapes of the inner case **11** and the outer case **13** are deformed.

The first reinforcement member **110** may be disposed in a shape of an unevenness having a maximum height H without disturbing a flow of the insulating material **15** foamed between the inner case **11** and the outer case **13**.

The first reinforcement member **110** may be attached to the inner case **11** or the outer case **13** using an adhesion unit, such as a double-sided tape. Alternatively, or additionally, other adhesive type materials may be used to attach the first reinforcement member **110** to the inner case **11** or the outer case **13** (e.g., glue, paste, etc.), and/or the first reinforcement member **110** may be attached to the inner case **11** or the outer case **13** using a fastening member (e.g., a screw, a bolt, a pin, a rivet, an anchor, an adhesive, and the like). Although not shown, the first reinforcement member **110** may include a fixing unit that may fix the first reinforcement member **110** to the inner case **11** or the outer case **13** so as to prevent the first reinforcement member **110** attached to the inner case **11** or the outer case **13** from being moved when the insulating material **15** is foamed.

Like the first reinforcement member **110**, the second reinforcement member **120** disposed at the lower portion of the body **10** may have a smaller length than a length of both sides of the body **10** in the forward/backward direction and may be disposed to have a thickness T**2** of about 0.5 mm.

The second reinforcement member **120** may have a maximum height H**2** between the inner case **11** and the outer case **13** so as to increase a cross-sectional coefficient in a direction in which shapes of the inner case **11** and the outer case **13** are deformed.

Like the first reinforcement member **110**, although not shown, the second reinforcement member **120** may include a fixing unit that may fix the second reinforcement member **120** to the inner case **11** or the outer case **13** so as to prevent the second reinforcement member **120** attached to the inner case **11** or the outer case **13** from being moved when the insulating material **15** is foamed.

As illustrated in FIG. **7**, when the insulating material **15** is foamed between the inner case **11** and the outer case **13** and flows in a direction from the upper portion of the body **10** to the lower portion of the body **10**, a reinforcement member **130** may be disposed at both sides of the body **10** in the lengthwise direction.

When the reinforcement member **130** is disposed at both sides of the body **10** in the lengthwise direction, the reinforcement member **130** has a smaller length than a length of both sides of the body **10** in a vertical direction and may be disposed to have a thickness of about 0.5 mm.

The reinforcement member **130** disposed at both sides of the body **10** in the lengthwise direction may have the same shape as that of the first reinforcement member **110** and may be disposed in a shape in which only the length of the reinforcement member **130** is larger than that of the first reinforcement member **110**.

Also, like the first reinforcement member **110** and the second reinforcement member **120**, the reinforcement member **130** may be attached to the inner case **11** between the inner case **11** and the outer case **13**, as illustrated in FIG. **7**, and although not shown in the drawings, the reinforcement member **130** may also be attached to the outer case **13**.

As described above, the reinforcement members **100** and **130** are disposed between the inner case **11** and the outer case **13** at both sides of the body **10** so that rigidity of the body **10** is reinforced and a quantity of deformation of the body **10** caused by the difference in the quantities of thermal contraction between the inner case **11** and the outer case **13** may be reduced. Although example embodiments have been provided in which one or two reinforcement members are disposed on a side of the body **10**, the disclosure is not so limited. For example, more than two reinforcement members may be disposed on a side of the body **10**, and the number of reinforcement members may be determined according to a size of the side of the body **10**, for example. Also, the reinforcement members may be arranged or oriented at other angles than a horizontal or vertical orientation (e.g., diagonally).

As illustrated in FIGS. **1** through **3**, the thickness of the insulating material **15** foamed between the inner case **11** and the outer case **13** needs to be reduced so as to increase the internal capacity of the body **10** having the same exterior size. When the thickness of the insulating material **15** is reduced, insulation performance may be lowered, and rigidity is deteriorated such that deformation may occur in the body **10** due to the weight of the body **10** and a load of a material stored in the body **10**.

In order to improve the insulation performance that is lowered due to the reduced thickness of the insulating material, a vacuum insulation panel (VIP) **19** may be disposed between the inner case **11** and the outer case **13** together with the insulating material **15**.

The VIP **19** may have approximately eight times larger insulation performance than that of the insulating material **15**, and an inside of the VIP **19** may be vacuum treated so as to maximize the insulation performance.

The VIP **19** may be disposed between the inner case **11** and the outer case **13** together with the insulating material **15** and may supplement the lowered insulation performance but may not supplement deteriorated rigidity.

As illustrated in FIGS. **8** and **9**, a reinforcement frame **200** may be disposed at the front side of the body **10** so as to supplement the deteriorated rigidity of the body **10**. Reinforcement frame **200** may be provided in addition to, or instead of, reinforcement members **100** and/or **130**. Thus, it may be understood by one of ordinary skill in the art that the reinforcement frame **200** shown in FIGS. **8** and **9** may be included in a refrigerator together with reinforcement members **100** and/or **130** as shown in FIGS. **3** through **7**, for example.

The reinforcement frame **200** may be disposed at a front side of the inner case **11** and may supplement rigidity of the body **10**. The reinforcement frame **200** may include one or more of an upper reinforcement frame **210** coupled to an upper portion of the front side of the inner case **11**, an intermediate reinforcement frame **220** coupled to a central portion of the front side of the inner case **11** to which the first partition **17***a* is coupled, a lower reinforcement frame **230** coupled to a lower portion of the front side of the inner case **11**, and a first side reinforcement frame **240** and a second side reinforcement frame **250** coupled to both sides of the front side of the inner case **11**.

The first side reinforcement frame **240** may be disposed at an upper portion of both sides of the front side of the inner case **11**, and a part of a top end of the first side reinforcement frame **240** may be disposed to overlap the upper reinforcement frame **210**, and a bottom end of the first side reinforcement frame **240** may be disposed to extend from the top end of the first side reinforcement frame **240** to a space between the intermediate reinforcement frame **220** and the lower reinforcement frame **230**.

The second side reinforcement frame **250** may be disposed at a lower portion of both sides of the front side of the inner case **11**, and a bottom end of the second side reinforcement frame **250** may be coupled to the lower reinforcement frame **230**, and a top end of the second side reinforcement frame **250** may be disposed to extend from the bottom end of the second side reinforcement frame **250** to a position at which the top end of the second side reinforcement frame **250** is spaced a predetermined distance apart from the bottom end of the first side reinforcement frame **240**. The intermediate reinforcement frame **220** may extend from one side of the front side of the inner case **11** to the other side of the front side of the inner case **11** (e.g., in the horizontal direction at a position corresponding to the first partition **17***a*). The intermediate reinforcement frame **220** may overlap with and/or be coupled to a part of the first side reinforcement frame **240** (e.g., a middle part) on both sides of the front side of the inner case **11**. The lower reinforcement frame **230** may extend from one side of the front side of the inner case **11** to the other side of the front side of the inner case **11** (e.g., in the horizontal direction at a position corresponding to a bottom of the body **10**). The lower reinforcement frame **230** may overlap with and/or be coupled to a part of the second side reinforcement frame **250** (e.g., a bottom part) on both sides of the front side of the inner case **11**.

As illustrated in FIGS. **1** through **3**, an electric apparatus box **300** in which electric apparatus components for controlling an operation of the refrigerator are accommodated, may be disposed in the front of the upper portion of the body **10**.

As illustrated in FIGS. **10** through **14**, the electric apparatus box **300** may include a base **310** installed to cover an electric apparatus box installation hole **13***a* disposed in the front of the upper portion of the body **10**, a cover **320** that covers an upper portion of the base **310** so that an accommodation space S may be formed in the upper portion of the base **310**, a printed circuit board (PCB) **330** which is disposed in the accommodation space S and on which electronic components **331** are mounted, a PCB mounting portion **340** on which the PCB **330** is mounted, and a reinforcement plate **350** disposed between the PCB mounting portion **340** and the cover **320**.

The base **310** may include a base portion **311** coupled to the front of the upper portion of the body **10** and an accommodation groove **317** accommodated in the electric

apparatus box installation hole **13***a* when the base portion **311** is coupled to the front of the upper portion of the body **10**.

The base portion **311** forms edges of the accommodation groove **317** which may have a rectangular shape, and a plurality of fixing hooks **313** may be disposed at a front edge and a rear edge of the accommodation groove **317**, and a wire through hole **315** through which wires **333** connected to the PCB **330** may be connected to the inside of the body **10**, is disposed in the rear of both sides of the base portion **311**.

Each of the plurality of fixing hooks **313** may include a plurality of first fixing hooks **313***a* disposed at the front edge of the accommodation groove **317** and a plurality of second fixing hooks **313***b* disposed at the rear edge of the accommodation groove **317**.

The plurality of first fixing hooks **313***a* may be inserted into and fixed to the upper reinforcement frame **210** coupled to the upper portion of the front side of the inner case **11**, and the plurality of second fixing hooks **313***b* may be inserted into and fixed to a rear edge of the electric apparatus box installation hole **13***a*.

Since the first fixing hooks **313***a* and the second fixing hooks **313***b* disposed at the base portion **311** may be fixed to the upper reinforcement frame **210** and the rear edge of the electric apparatus box installation hole **13***a*, respectively, the base **310** serves as an outer case when the base **310** is coupled to the front of the upper portion of the body **10**, and the base **310** may be maintained in a fixed state without being moved, due to a foaming pressure when the insulating material **15** is foamed between the inner case **11** and the outer case **13**.

Since the accommodation groove **317** may be accommodated in the electric apparatus box installation hole **13***a* disposed in the front side of the upper portion of the body **10**, the accommodation groove **317** may have a shape in which it is recessed from the upper portion of the body **10** based on the upper portion of the body **10**.

Since the accommodation groove **317** may be disposed in the shape in which it is recessed from the upper portion of the body **10**, a height of the accommodation space S disposed between the base **310** and the cover **320** may be increased, and a height of the electric apparatus box **300** disposed at the front side of the upper portion of the body **10** may be visually decreased.

The cover **320** may be coupled to the upper portion of the base **310** so that the accommodation space S may be formed between the base **310** and the cover **320**. The cover **320** may include a hinge cover portion **321** that covers an upper portion of the upper hinge **41** coupled to the upper portion of the body **10** so that the door **30** may be rotatably coupled to the body **10**.

A plurality of PCBs **330** may be disposed and may be accommodated in the accommodation space S formed between the base **310** and the cover **320**, and a plurality of electronic components **331** may be mounted on a lower surface of each of the plurality of PCBs **330**.

An upper surface of each of the plurality of PCBs **330** on which no electronic components **331** are mounted, may be mounted on the PCB mounting portion **340**, and the PCB mounting portion **340** may be coupled to the cover **320**.

Since the PCB mounting portion **340** on which the plurality of PCBs **330** are mounted, is coupled to the cover **320**, the plurality of PCBs **330** may be placed in the accommodation space S at a position that is the farthest from the upper storage compartment **21**.

Since the plurality of PCBs **330** are placed in the accommodation space S at the position that is the farthest from the upper storage compartment **21**, heat generated in the electronic components **331** mounted on the plurality of PCBs **330** may be prevented from being transferred to an inside of the upper storage compartment **21** as much as possible.

A connector coupling portion **341** may be disposed at both sides of the PCB mounting portion **340**, and a wire connector **335** to which the wires **333** connected to the PCBs **330** are fixed, may be coupled to the connector coupling portion **341**.

Thus, the wires **333** connected to the PCBs **330** may be agglomerated and are fixed using the wire connector **335** coupled to the connector coupling portion **341**, and the wires **333** agglomerated by the wire connector **335** may be connected to the inside of the body **10** through the wire through hole **315** formed in the base **310**.

Thus, the wires **333** connected to the PCBs **330** pass through the wire through hole **315** formed in the base **310** through both sides of the PCB mounting portion **340**. The wires **333** that pass through the wire through hole **315** may be connected to the inside of the body **10** via a hinge hole **41***a* of the upper hinge **41**. That is, for example as shown in FIG. **1** where two doors are provided, wires **333** may pass through a wire through hole **315** which is disposed at opposite sides of the base **310** at positions corresponding to a hinge hole **41***a* of an upper hinge **41** disposed at an upper part of each of the doors.

The reinforcement plate **350** which may be formed of a steel material, may be disposed between the PCB mounting portion **340** on which the plurality of PCBs **330** are mounted, and the cover **320**.

The reinforcement plate **350** reduces shock transferred to the plurality of PCBs **330** accommodated in the accommodation space S when the shock is applied to an upper portion of the electric apparatus box **300**, thereby protecting the electronic components **331**.

Also, when or if a fire breaks out in the electronic components **331** mounted on the plurality of PCBs **330**, the reinforcement plate **350** may prevent the fire from being spread toward an outside of the electric apparatus box **300** so that the risk of a fire accident or fire damage may be reduced.

As illustrated in FIGS. **15** through **19**, a heating pipe **400** for preventing dew condensation that occurs in the outer case **13** may be disposed at the front edge of the inner case **11** of the body **10**.

When the refrigerator operates, cold air in the storage compartment **20** flows into the outer case **13** that constitutes the exterior of the body **10** so that dew condensation may occur in the outer surface of the outer case **13** due to a difference in temperatures of an inside and an outside of the outer case **13**.

In order to prevent dew condensation that occurs in the outer surface of the outer case **13**, the heating pipe **400** through which a high-temperature refrigerant flows, is fixed to the front edge of the inner case **11**.

A plurality of mounting portions **410** on which the heating pipe **400** is mounted, may be disposed at the front edge of the inner case **11**.

The plurality of mounting portions **410** disposed at the front edge of the inner case **11** may be disposed most adjacent to the outer case **13** when the inner case **11** and the outer case **13** are coupled to each other.

Since the mounting portions **410** are disposed most adjacent to the outer case **13**, the heating pipe **400** mounted on the mounting portions **410** may be disposed at a position at

which the heating pipe **400** is spaced apart from the inside of the storage compartment **20** as much as possible and may be disposed most adjacent to the outer case **13**.

Since the heating pipe **400** is disposed at the position at which it is spaced apart from the inside of the storage compartment **20** as much as possible, the possibility that high-temperature heat generated by the high-temperature refrigerant that flows through an inside of the heating pipe **400** will be transferred to the inside of the storage compartment **20**, may be reduced.

When the high-temperature heat is transferred to the inside of the storage compartment **20**, due to the high-temperature heat, the temperature of the inside of the storage compartment **20** rises and thus, energy is consumed so as to lower the temperature of the inside of the storage compartment **20**.

Since the possibility that the high-temperature heat will be transferred to the inside of the storage compartment **20** is reduced by spacing the heating pipe **400** apart from the inside of the storage compartment **20** as much as possible, a rising width (increase) of the temperature of the inside of the storage compartment **20** may be reduced so that consumption of energy for lowering the temperature of the inside of the storage compartment **20** may be reduced.

Also, since the heating pipe **400** is disposed most adjacent to the outer case **13**, even when the high-temperature heat generated by the high-temperature refrigerant that flows through the inside of the heating pipe **400** is well transferred to the outer case **13** and the cold air in the storage compartment **20** flows into the outer case **13**, the temperature difference between the outside and the inside of the outer case **13** is reduced so that dew condensation that occurs in the outer surface of the outer case **13** may be prevented.

The heating pipe **400** mounted on the mounting portions **410** may be fixed to the mounting portions **410** using a plurality of clips **430**. A fixing groove **420** to which the plurality of clips **430** may be fixed, may be disposed in a part of the plurality of mounting portions **410**.

The fixing groove **420** may include a first fixing groove **421** and a second fixing groove **423** to which both ends of the clips **430** are inserted and fixed. The clips **430** may include a first fixing portion **431** inserted into and fixed to the first fixing groove **421** and a second fixing portion **433** inserted into and fixed to the second fixing groove **423**. As can be seen from FIG. **19**, a first end of the clip **430** (first fixing portion **431**) is bent such that it is fixed to the first fixing groove **421**. The clip **430** extends from the first end around at least a portion of the heating pipe **400**, at the second end of the clip **430** (second fixing portion **433**) is bent such that it is fixed to the second fixing groove **423**.

The clips **430** may be fixed to the fixing groove **420** so that the heating pipe **400** may be accommodated in the clips **430**, and the heating pipe **400** may be fixed to the mounting portions **410**.

Since the heating pipe **400** may be fixed to the mounting portions **410** using the clips **430** in a state in which the heating pipe **400** is mounted on the mounting portions **410**, the heating pipe **400** may be easily fixed to the front edge of the inner case **11**.

As illustrated in FIGS. **18** and **19**, the first fixing groove **421** may be indented from an outer surface of the inner case **11**, and the second fixing groove **423** may also be indented from the outer surface of the inner case. The first fixing portion **431** may be insertedly fixed to the first fixing groove **421** and the second fixing portion **433** may be insertedly fixed to the second fixing groove **433**. The heating pipe **400** may be disposed in the second fixing groove **423** and a portion of the clip **430** may surround a portion of the heating pipe **400** to secure the heating pipe **400** in the second fixing groove **433**.

As illustrated in FIGS. **1** and **2**, a storage unit **500** may be disposed in the storage compartment **20** and may slide in the forward/backward direction.

The storage unit **500** may be disposed in the left storage compartment **25** or the right storage compartment **26** of the lower storage compartment **23**, and merely for convenience or explanation, the storage unit **500** disposed in the right storage compartment **26** will now be described.

As illustrated in FIGS. **20** through **27** and **31**, the storage unit **500** may include a first storage box **510** that is supported at both sidewalls of the right storage compartment **26** and slides in the forward/backward direction, a second storage box **520** that is disposed in the first storage box **510** and slides in the forward/backward direction, and a sliding shelf **530** that causes the first storage box **510** to be inserted into the right storage compartment **26** and to be taken out from the right storage compartment **26** in a sliding manner.

The sliding shelf **530** may be coupled to a lower portion of the first storage box **510** so that the first storage box **510** may be inserted into and taken out from the right storage compartment **26**.

A coupling portion **26***a* for coupling a cover rail **550** may be disposed at both sidewalls of the right storage compartment **26**. The coupling portion **26***a* may be integrally disposed at both sidewalls of the right storage compartment **26**.

The coupling portion **26***a* may be disposed in such a way that the cover rail **550** may be inserted into the coupling portion **26***a* in the sliding manner.

A procedure in which the sliding shelf **530** is installed, will now be described. First, the cover rail **550** of the sliding shelf **530** may be pushed to the coupling portion **26***a* in the sliding manner, and a fastening member B may be inserted into a fastening hole **551** formed in the cover rail **550** so that the cover rail **550** may be coupled to the coupling portion **26***a*. For example, the fastening member B may include a screw, a bolt, a pin, a rivet, an anchor, an adhesive, and the like.

When the cover rail **550** is coupled to the coupling portion **26***a*, a slide unit **540** may be taken out from an outside of the right storage compartment **26** and then, the first storage box **510** may be coupled to the slide unit **540** so that a coupling protrusion **541***a* disposed on the slide unit **540** may be inserted into a coupling groove **511** of the first storage box **510**.

When the first storage box **510** is coupled to the slide unit **540**, the slide unit **540** may be guided along the cover rail **550** in the sliding manner so that the first storage box **510** may be inserted into and taken out from the inside of the right storage compartment **26**.

Since the sliding shelf **530** is coupled to a lower portion of the first storage box **510**, the first storage box **510** may be fully taken out toward the outside of the right storage compartment **26** so that food stored in the first storage box **510** may be easily taken out and used or placed therein.

Also, since the sliding shelf **530** has a structure in which it is coupled to the lower portion of the first storage box **510**, food may be directly kept in an upper portion of the sliding shelf **530** without coupling the first storage box **510** to the upper portion of the sliding shelf **530**, and food may also be kept in the first storage box **510** by coupling the first storage box **510** to the upper portion of the sliding shelf **530**.

Next, a configuration of the sliding shelf **530** will be described in detail.

As illustrated in FIGS. **20** through **27**, the sliding shelf **530** may include the cover rail **550** coupled to both sidewalls of the right storage compartment **26**, the slide unit **540** that slides along the cover rail **550**, and a self closing unit **560** that is coupled to the slide unit **540** and transfers an elastic force in a direction in which the first storage box **510** is inserted into the right storage compartment **26**, so that the first storage box **510** may be easily closed with a small force.

The slide unit **540** may include a sliding portion **541** coupled to the lower portion of the first storage box **510** and a slide rail **543** that is disposed at both sides of the sliding portion **541** and slides along the cover rail **550**.

The coupling protrusion **541***a* may be disposed at an upper portion of both sides of a front side of the sliding portion **541** and may protrude in an upward direction so that the first storage box **510** and the sliding portion **541** may be coupled to each other. The coupling groove **511** in which the coupling protrusion **541***a* is inserted, may be disposed at a position corresponding to the coupling protrusion **541***a* in the first storage box **510**.

The cover rail **550** may be coupled to and fixed to the coupling portion **26***a*, as described above, and may guide the first storage box **510** to be inserted into and taken out from the right storage compartment **26** in the sliding manner.

As illustrated in FIGS. **26** through **30**, the self closing unit **560** may include a case **570** that is disposed at both sides of the lower portion of the sliding portion **541** and constitutes an exterior, an elastic unit **580** that is disposed in the case **570** and accumulates an elastic force when the first storage box **510** is taken out and that transfers the elastic force in a direction in which the first storage box **510** is inserted, when the first storage box **510** is inserted, and an oil damper **590** that is coupled to the elastic unit **580** and absorbs the shock that occurs when the first storage box **510** is inserted.

The elastic unit **580** may include a slider **581** that makes a straight motion in the case **570**, a rotator **583** that is rotatably coupled to the slider **581**, and an elastic member **585** having both ends connected to the slider **581** and the case **570**.

The slider **581** may include a rotation hole **581***a* through which a rotation shaft **583***b* disposed on the rotator **583** that will be described below is rotatably coupled, a first fixing groove **581***b* to which the elastic member **585** is fixed, and a second fixing groove **581***c* to which the oil damper **590** is fixed.

The slider **581** makes a straight motion along a guide rail **571** that will be described below, together with the rotator **583**. The elastic member **585** fixed to the first fixing groove **581***b* of the slider **581** is tensile through the straight motion so that the elastic member **585** may accumulate an elastic force.

The rotator **583** may include a protrusion portion **583***a* that protrudes from a lower portion of the rotator **583** in a downward direction so that the rotator **583** may be guided along the guide rail **571**, a rotation shaft **583***b* that causes the rotator **583** to be rotatably coupled to the slider **581**, and a hanging groove **583***c* in which a hanging member **553** disposed on the cover rail **550** is accommodated and is hung.

The protrusion portion **583***a* may be disposed to protrude from the lower portion of the rotator **583** toward the guide rail **571** and may be moved along the guide rail **571** so that the rotator **583** may be guided along the guide rail **571**.

The rotation shaft **583***b* may be disposed on the upper portion of the rotator **583** and may be rotatably coupled to the rotation hole **581***a* of the slider **581**.

The rotator **583** may be disposed to rotate around the rotation shaft **583***b* due to the rotation shaft **583***b* and makes a straight motion in a predetermined section together with the slider **581** and rotates.

The hanging groove **583***c* may be disposed in such a way that the hanging member **553** disposed on the cover rail **550** may be hung in the hanging groove **583***c* and when the first storage box **510** is inserted into and taken out from the right storage compartment **26**, the rotator **583** that is moved together with the first storage box **510** may be moved along the guide rail **571**.

Since the hanging member **553** disposed on the cover rail **550** fixed to the coupling portion **26***a* of the right storage compartment **26** may be maintained in a fixed state, when the first storage box **510** is inserted into and taken out from the right storage compartment **26**, if the hanging member **553** is hung in the hanging groove **583***c* of the rotator **583**, the rotator **583** is moved along the guide rail **571**.

The elastic member **585** may be disposed as a spring, and both ends of the elastic member **585** may be fixed to the case **570** and the slider **581**, respectively.

A portion of both ends of the elastic member **585** fixed to the case **570** may be maintained in the fixed state, and a portion of both ends of the elastic member **585** fixed to the slider **581** may be moved together with the slider **581** when the slider **581** makes a straight motion, is tensile, is returned to its original state, and transfers the elastic force to the first storage box **510**.

The case **570** may be disposed at the lower portion of the sliding portion **541** and constitutes an exterior. The elastic unit **580** and the oil damper **590** may be accommodated in the case **570**.

The guide rail **571** in which the protrusion portion **583***a* of the rotator **583** is accommodated and is moved, a guide portion **573** that is a path on which the hanging member **553** moved together with the rotator **583** is moved, a fixing portion **575** to which the elastic member **585** is fixed, a first accommodation portion **577** in which the elastic member **585** is accommodated, and a second accommodation portion **579** in which the oil damper **590** is accommodated, may be disposed in the case **570**.

The guide rail **571** may be disposed in such a way that the protrusion portion **583***a* disposed on the rotator **583** may be accommodated and moved, and the rotator **583** and the slider **581** may be guided on the guide rail **571**, as described above.

The guide rail **571** may include a straight path **571***a* on which the rotator **583** is guided to make a straight motion in the forward/backward direction, and a hanging portion **571***b* disposed on one end of the straight path **571***a* so that the rotator **583** may rotate and may be fixed.

The guide portion **573** may be disposed to be parallel to the straight path **571***a* of the guide rail **571** and may guide the hanging member **553** that is hung in the hanging groove **583***c* of the rotator **583** and may be moved together with the rotator **583**, to make a straight motion.

The oil damper **590** may include a body portion **591** that is filled with oil and is accommodated in the second accommodation portion **579** of the case **570**, and a movement portion **593** that is accommodated in the body portion **591** and has one end fixed to the second fixing groove **581***c* of the slider **581**.

Since one end of the movement portion **593** may be fixed to the slider **581**, the movement portion **593** may be moved together with the slider **581**.

Since, when the first storage box **510** is inserted into and taken out from the right storage compartment **26**, the slider **581** may also be moved together with the first storage box

510 in the same direction as that of the first storage box **510**, when the first storage box **510** is inserted into the right storage compartment **26**, the movement portion **593** is inserted into the body portion **591**, and when the first storage box **510** is taken out from the right storage compartment **26**, the movement portion **593** is also taken out from an inside of the body portion **591** outwards.

Since, when the movement portion **593** is taken out from and is inserted into the inside of the body portion **591**, the movement portion **593** absorbs shock through the oil filled in the body portion **591**, a rapid movement of the elastic unit **580** that occurs when the first storage box **510** is inserted into the right storage compartment **26**, may be prevented due to the elastic force of the elastic unit **580**.

Thus, the shock that occurs when the first storage box **510** is rapidly inserted into the right storage compartment **26**, is absorbed due to the elastic force of the elastic unit **580** so that noise may be reduced.

The body portion **591** may be maintained in a state in which it is accommodated in the second accommodation portion **579** of the case **570**, and only the movement portion **593** is moved together with the slider **581**, and a hanging jaw **579***a* may be disposed on the second accommodation portion **579** so that the movement portion **593** may be taken out from and inserted into the inside of the body portion **591** through the hanging jaw **579***a*.

The hanging jaw **579***a* may be disposed in such a way that a space which the body portion **591** does not pass through and only the movement portion **593** may pass through is formed, and when the movement portion **593** is moved together with the slider **581**, the body portion **591** may be hung in the hanging jaw **579***a* so that movement may be prevented.

The first storage box **510** may be inserted into and taken out from the right storage compartment **26** in a sliding manner by using the sliding shelf **530**.

As illustrated in FIGS. **31** through **34**, the first storage box **510** may include a coupling groove **511** into which the coupling protrusion **541***a* of the sliding shelf **530** is inserted and is coupled, a guide rail **513** on which the second storage box **520** is guided to slide in the forward/backward direction, and a first storage box handle **515** (see FIG. **25**) through which the first storage box **510** is grasped by a user and may be inserted into and taken out from the right storage compartment **26**.

The guide rail **513** may be disposed at both sides of an inside of the first storage box **510**, and the second storage box **520** may be guided on the guide rail **513** so as to slide in the forward/backward direction.

The guide rail **513** may be disposed to have a shape in which it is recessed from both sides of the inside of the first storage box **510** toward an outside of the first storage box **510**.

The second storage box **520** may be accommodated in the first storage box **510** and slides in the forward/backward direction. The second storage box **520** may include a roller **521** that causes the second storage box **520** to be guided along the guide rail **513** disposed in the first storage box **510** and to slide in the forward/backward direction in the first storage box **510**, and a second storage box handle **523** through which the second storage box **520** may be grasped by the user and may be moved in the forward/backward direction in the first storage box **510**.

The roller **521** may be disposed at a lower portion of both sides of an outside of the second storage box **520** and may be guided along the guide rail **513** disposed in the first storage box **510**, and an escape prevention jaw **513***a* may be disposed on an upper portion of the guide rail **513** so that escape of the roller **521** may be prevented.

Since the second storage box **520** may be accommodated in the first storage box **510** and slides in the forward/backward direction, the guide rail **513** disposed at both sides of the inside of the first storage box **510** may be disposed at a position at which the guide rail **513** is spaced apart from an upper edge surface of the first storage box **510** in the downward direction by a distance at which an upper edge surface of the second storage box **520** and the roller **521** are spaced apart from each other. For example, the upper edge surface of the second storage box **520** may be substantially even with the upper edge surface of the first storage box **510** when the second storage box **520** is inserted or disposed on the guide rail **513** disposed in the first storage box **510**.

When the first storage box **510** is inserted into and taken out from the right storage compartment **26**, the second storage box **520** may be inserted into and taken out from the right storage compartment **26** together with the first storage box **510**. Since the second storage box **520** is disposed to slide in the forward/backward direction in the first storage box **510**, an internal space of the first storage box **510** may be efficiently used.

As illustrated in FIGS. **1** and **2**, the plurality of shelf units **600** may be disposed in the upper storage compartment **21** so that the upper storage compartment **21** may be partitioned off into a plurality of parts.

As illustrated in FIGS. **35** through **39**, the plurality of shelf units **600** may include a shelf **610** including a first shelf **611** and a second shelf **613**, a bracket **620** that is coupled to both sides of the first shelf **611** and both sides of the second shelf **613** and supports the first shelf **611** and the second shelf **613**, and a leveling portion **630** that is disposed at the bracket **620** and levels the first shelf **611** and the second shelf **613**.

The shelf **610** may include the first shelf **611** disposed at the left side of the upper storage compartment **21** and the second shelf **613** disposed at the right side of the upper storage compartment **21**, for example. However, this is only one example, and only one shelf may be disposed in a horizontal direction in the refrigerator or more than two shelves may be disposed adjacent to one another in a horizontal direction in the refrigerator. The first shelf **611** and the second shelf **613** may be leveled with respect to each other and partition off the upper storage compartment **21**.

A first protrusion portion **611***a* may be disposed at a front end of a right surface of the first shelf **611**, and a second protrusion portion **613***a* may be disposed at a front end of a left surface of the second shelf **613** so as to be spaced apart from the first protrusion portion **611***a* by a predetermined distance.

The first protrusion portion **611***a* and the second protrusion portion **613***a* may be maintained to be spaced apart from each other by a predetermined distance. When the first shelf **611** is twisted in a right direction or the second shelf **613** is twisted in a left direction, the first protrusion portion **611***a* and the second protrusion portion **613***a* contact each other.

When the first shelf **611** is twisted in the right direction, the first protrusion portion **611***a* contacts the second protrusion portion **613***a* so that the first shelf **611** is not twisted in the right direction any more. When the second shelf **613** is twisted in the left direction, the second protrusion portion **613***a* contacts the first protrusion portion **611***a* so that the second shelf **613** is not twisted in the left direction any more and the first shelf **611** and the second shelf **613** may be prevented from being twisted in a horizontal direction.

The bracket **620** may include a first bracket **621** that is coupled to the left surface of the first shelf **611** and supports the first shelf **611**, a second bracket **623** that is coupled to the right surface of the first shelf **611** and supports the first shelf **611**, a third bracket **625** that is coupled to the left surface of the second shelf **613** and supports the second shelf **613**, and a fourth bracket (not shown) that is coupled to the right surface of the second shelf **613** and supports the second shelf **613**.

The bracket **620** may be supported by a support portion **640** disposed between the first cold air duct **700** and the inner case **11** through a shelf unit fixing hole **713** formed in the first cold air duct **700**.

Food or other objects may be stacked on upper portions of the first shelf **611** and the second shelf **613** and may be stored therein. Types of food stored in the upper portion of the first shelf **611** and the upper portion of the second shelf **613** may be different from each other, and therefore each shelf may be subject to a different load being applied thereto.

For example, if the type of food stored in the upper portion of the first shelf **611** and the type of food stored in the upper portion of the second shelf **613** are different from each other, weights of the food may be different from each other. Thus, the first shelf **611** and the second shelf **613** may not be leveled, and one shelf **610** may sag in the downward direction.

As described above, the leveling portion **630** may be disposed at the bracket **620** that supports the shelf **610** so that one shelf **610** of the first shelf **611** and the second shelf **613** may not sag in the downward direction and may be leveled.

The leveling portion **630** may include a first fixing portion **631** coupled to the second bracket **623** that supports the right surface of the first shelf **611**, and a second fixing portion **633** coupled to the third bracket **625** that supports the left surface of the second shelf **613**.

The first fixing portion **631** and the second fixing portion **633** may be coupled to the second bracket **623** and the third bracket **625** by using a fastening member B, and a fixing protrusion **631***a* may be disposed at the first fixing portion **631**, and a fixing groove **633***a* may be disposed in the second fixing portion **633**. As noted above, the fastening member B may include a screw, a bolt, a pin, a rivet, an anchor, an adhesive, and the like.

The first fixing portion **631** may be disposed at the right surface of the second bracket **623**, and the second fixing portion **633** may be disposed at the left surface of the third bracket **625**, and the fixing protrusion **631***a* and the fixing groove **633***a* may be disposed to correspond to each other when the first shelf **611** and the second shelf **613** are leveled.

Since the fixing protrusion **631***a* and the fixing groove **633***a* may be disposed to correspond to each other and the fixing protrusion **631***a* is disposed to be inserted into the fixing groove **633***a* and fixed thereto, when the fixing protrusion **631***a* is inserted into and fixed to the fixing groove **633***a*, the first shelf **611** and the second shelf **613** are leveled.

Also, since the fixing protrusion **631***a* may be inserted into and fixed to the fixing groove **633***a*, even though the first shelf **611** and the second shelf **613** may be in a state in which different types of food are stored (i.e., different loads are applied thereto), and/or may be used for a long time, one of the first shelf **611** and the second shelf **613** may be prevented from sagging in the downward direction and thus, the first shelf **611** and the second shelf **613** may be leveled.

As illustrated in FIGS. **2** and **3** and **40** through **42**, the first evaporator E**1** and the first blower fan F**1** that supply the cold air to the upper storage compartment **21** may be disposed between the first cold air duct **700** and the inner case **11**.

The first cold air duct **700** may include a front plate **710** in which a plurality of first cold air outlets **711** are disposed, a cold air flow path portion **720** that is disposed at a rear side of the front plate **710** and constitutes the first flow path **725** on which the cold air is moved, and a first blower fan mounting portion **730** disposed at a lower portion of the cold air flow path portion **720**.

The front plate **710** may be formed of a metal material (e.g., an aluminum material) so that the front plate **710** may be uniformly cooled by the cold air in the upper storage compartment **21** through thermal conduction and the inside of the upper storage compartment **21** may be maintained at a uniform temperature.

The plurality of first cold air outlets **711** through which the cold air guided through the first flow path **725** is discharged into the upper storage compartment **21**, and the shelf unit fixing hole **713** for fixing the shelf unit **600** may be disposed on the front plate **710**.

A lower portion of the front plate **710** may be disposed in a streamline form that is bent in a direction of the upper storage compartment **21** as the front plate **710** gets closer to the downward direction. This is to provide a space in which the first blower fan F**1** may be installed, in an upper portion of the first evaporator E**1** so as to be adjacent to the first evaporator E**1**.

Since the first blower fan F**1** may be disposed at the lower portion of the front plate **710**, the remaining portions except for the lower portion of the front plate **710** may be provided in a flat plate form.

A barrier wall **740** that constitutes the space in which the first evaporator E**1** and the first blower fan F**1** are installed at a lower portion of the rear side of the upper storage compartment **21**, may be disposed at the lower portion of the front plate **710**.

Since the barrier wall **740** constitutes the space in which the first evaporator E**1** and the first blower fan F**1** are installed, the barrier wall **740** may be disposed to be further spaced apart from the inner case **11** than a spaced distance between the first cold air duct **700** and the inner case **11**.

Thus, an upper portion of the barrier wall **740** may be in close contact with the lower portion of the front plate **710** disposed to be bent in the streamline form so that the space between the first cold air duct **700**, the barrier wall **740**, and the inner case **11** and the upper storage compartment **21** may be sealed.

The cold air flow path portion **720** may include a first cold air flow path portion **721** in which a plurality of discharge holes **721***a* corresponding to the plurality of first cold air outlets **711** are disposed and which is disposed at the rear side of the front plate **710**, and a second cold air flow path portion **723** that is coupled to a rear side of the first cold air flow path portion **721** and causes the first flow path **725** to be formed between the second cold air flow path portion **723** and the first cold air flow path portion **721**.

The first blower fan mounting portion **730** may be disposed at a lower portion of the cold air flow path portion **720** and may include a housing **731** on which the first blower fan F**1** is rotatably mounted, and a cover member **733** that covers an open front side of the housing **731**.

A drainage portion **750** for draining condensed water generated in the first evaporator E**1** may be disposed at the lower portion of the first evaporator E**1**. The drainage portion **750** may be disposed to have an inclined surface **751** that is inclined in the downward direction as it gets closer to

a right side of the drainage portion **750** based on a central part of the drainage portion **750**, and a drainage hole **753** is formed in a distal end of the inclined surface **751**.

A drainage pipe **755** for draining the condensed water toward the outside of the body **10** may be disposed in the drainage hole **753**. The drainage pipe **755** may be disposed between the inner case **11** and the outer case **13** of the right surface of the body **10**. In an alternative embodiment, the arrangement of the drainage portion **750** may be reversed. For example, the drainage portion **750** may be disposed to have an inclined surface **751** that is inclined in the downward direction as it gets closer to a left side of the drainage portion **750** based on a central part of the drainage portion **750**, and a drainage hole **753** may be formed in a distal end of the inclined surface **751**, such that the drainage pipe **755** may be disposed between the inner case **11** and the outer case **13** of the left surface of the body **10**.

Since the drainage pipe **755** may be disposed between the inner case **11** and the outer case **13** of the side of the body **10** (not between the inner case **11** and the outer case **13** of the rear side of the body **10**), when the insulating material **15** is foamed in the space between the inner case **11** and the outer case **13** of the rear side of the body **10**, the insulating material **15** may flow smoothly. A configuration in which the insulating material **15** is foamed in the space between the inner case **11** and the outer case **13** of the rear side of the body **10**, will be described below.

As illustrated in FIGS. **2** and **43**, the machine compartment **28** disposed at the lower side of the rear of the body **10** may be covered by the machine compartment cover **29**.

The machine compartment cover **29** may include a machine compartment upper cover **29***a* that covers the front side and the upper portion of the machine compartment **28** and a machine compartment rear cover **29***b* that covers the rear side of the machine compartment **28**.

In the drawings, an insulating material inlet **29***c* (see, e.g., FIG. **44**) that will be described below is disposed at a position at which the insulating material **15** is foamed in the space between the inner case **11** and the outer case **13** of the body **10**. A space in which the insulating material **15** is filled, will be described as the space between the inner case **11** and the outer case **13**.

However, the insulating material inlet **29***c* may be disposed at a position at which the insulating material **15** may be foamed in the door **30**.

The insulating material **15** may be foamed and filled in the space between the inner case **11** and the outer case **13** by using a foaming head **810**.

The insulating material inlet **29***c* may be disposed at the machine compartment upper cover **29***a* of the machine compartment cover **29** that covers the machine compartment **28** so as to foam the insulating material **15** in the space between the inner case **11** and the outer case **13**.

The insulating material inlet **29***c* may be disposed at a position corresponding to a space of the rear side of the body **10** so as to foam the insulating material **15** into the space of the rear side of the body **10** of the space between the inner case **11** and the outer case **13**.

The insulating material inlet **29***c* may be disposed in the middle of the machine compartment cover **29** so that the insulating material **15** foamed through the insulating material inlet **29***c* may be uniformly filled in the space between the inner case **11** and the outer case **13**.

In order to foam the insulating material **15** in the space between the inner case **11** and the outer case **13**, the foaming head **810** connected to the insulating material inlet **29***c* disposed at the machine compartment upper cover **29***a* and a guide member **820** connected to the insulating material inlet **29***c* in the space between the inner case **11** and the outer case **13** are disposed.

The foaming head **810** foams the insulating material **15** into the insulating material inlet **29***c* so that the insulating material **15** may be filled in the space between the inner case **11** and the outer case **13**.

In the drawings, only one insulating material inlet **29***c* is disposed, and one foaming head **810** is configured to correspond to the insulating material inlet **29***c*. However, embodiments of the disclosure are not limited thereto, and a plurality of insulating material inlets may be disposed, and a plurality of foaming heads may be configured to correspond to the plurality of insulating material inlets.

When the foaming head **810** is connected to the insulating material inlet **29***c* and foams the insulating material **15**, the insulating material **15** is foamed into the space between the inner case **11** and the outer case **13** from the insulating material inlet **29***c* and is filled therein. In a large refrigerator and a refrigerator having a thin insulation thickness wall in which a distance between the inner case **11** and the outer case **13** is narrow, the flow of the insulating material **15** may be disturbed by an obstacle, such as a wire (not shown) in the space between the inner case **11** and the outer case **13** so that a discharge distance of the insulating material **15** is reduced and the entire space between the inner case **11** and the outer case **13** may not be uniformly filled.

Also, in order to uniformly fill the entire space between the inner case **11** and the outer case **13**, a quantity of the insulating material **15** foamed in the space between the inner case **11** and the outer case **13** need to be excessively injected compared to the volume of the space between the inner case **11** and the outer case **13**.

If the insulating material **15** is excessively injected, a hardening time of the insulating material **15** foamed into the space between the inner case **11** and the outer case **13** may be delayed, and a part of the insulating material **15** is exposed to an outside of the space between the inner case **11** and the outer case **13** so that the exterior and quality of the refrigerator is lowered. Since the insulating material **15** exposed to the outside of the space between the inner case **11** and the outer case **13** need to be removed, this is inconvenient, and a working time when the insulating material **15** is filled in the space between the inner case **11** and the outer case **13** is delayed, and when the foaming head **810** is not properly managed, a void phenomenon that a pore having a crater shape is generated on the surface of the insulating material **15** hardened in the space between the inner case **11** and the outer case **13**, may occur.

In order to prevent the above-described problem, the guide member **820** is disposed in such a way that the insulating material **15** foamed by the foaming head **810** may be guided to a portion that extends by a predetermined section into the space between the inner case **11** and the outer case **13** rather than the insulating material inlet **29***c* without an interference, such as an obstacle.

One end of the guide member **820** may be connected to the insulating material inlet **29***c* in the space between the inner case **11** and the outer case **13**, and the other and of the guide member **820** may extend into the space between the inner case **11** and the outer case **13**, and the guide member **820** may guide the insulating material **15** foamed by the foaming head **810**.

As illustrated in FIGS. **43** and **44**, the guide member **820** may include a connector **821** coupled to the insulating material inlet **29***c* and a guide pipe **823** connected to the

connector **821** so as to extend into the space between the inner case **11** and the outer case **13**.

The guide pipe **823** may be formed as a hollow, straight pipe and may guide the insulating material **15** foamed by the foaming head **810** by a length of the guide pipe **823** in the space between the inner case **11** and the outer case **13** without an interference of an obstacle in the space between the inner case **11** and the outer case **13**.

Since an initial discharge position of the insulating material **15** foamed by the foaming head **810** using the guide pipe **823** extends from the insulating material inlet **29***c* into the space between the inner case **11** and the outer case **13** by the length of the guide pipe **823** and the initial discharge position of the insulating material **15** extends from a bottom end of the rear side of the body **10** to a central part of the body **10**, disturbance caused by the obstacle in the space between the inner case **11** and the outer case **13** may be minimized. Since a high pressure of the insulating material **15** is maintained while the insulating material **15** passes through an inside of the guide pipe **823**, the entire space between the inner case **11** and the outer case **13** may be uniformly filled with the insulating material **15**, and a quantity of injection of the insulating material **15** may be minimized.

In addition, the void phenomenon that occurs in the surface of the insulating material **15** when the insulating material **15** is foamed and the insulating material **15** is hardened in the space between the inner case **11** and the outer case **13** due to surface friction may be prevented, and the quantity of injection of the insulating material **15** may be minimized so that the insulating material **15** is not exposed to the outside and the working time may also be reduced.

As illustrated in FIG. **45**, a guide member **830** may be provided by forming a connector **831** and a guide pipe **833** as an integral body and may be coupled to the insulating material inlet **29***c*.

Except for the feature that the connector **831** and the guide pipe **833** are formed as an integral body, like the guide member **820** illustrated in FIG. **44**, the guide pipe **833** may be formed as a hollow, straight pipe and thus, a description thereof will be omitted.

As illustrated in FIGS. **46** and **47**, a guide pipe **825** may include a first guide pipe **827** that is formed as a hollow, straight pipe and is connected to the connector **821** and a second guide pipe **829** diverged from the first guide pipe **827**.

The second guide pipe **829** causes the insulating material **15** that passes through the first guide pipe **827** to be diverged in two directions and dispersed so that the entire space between the inner case **11** and the outer case **13** may be effectively filled.

The guide pipe **825** including the first guide pipe **827** and the second guide pipe **829** may have an overall hollow, Y shape. However, the disclosure is not limited thereto, and more than two pipes may diverge from the first guide pipe **827**.

As illustrated in FIG. **48**, the guide member **830** may be disposed by forming the connector **831** and a guide pipe **835** as an integral body and may be coupled to the insulating material inlet **29***c* and the guide pipe **835** may be disposed to have a hollow, Y shape.

The guide pipe **835** may be formed as a hollow, straight pipe, like the guide pipe **825** illustrated in FIG. **46**. The guide pipe **835** may include a first guide pipe **837** connected to the connector **831** and a second guide pipe **839** diverged from the first guide pipe **837**.

As described above, when the insulating material **15** is foamed in the space between the inner case **11** and the outer case **13**, the guide members **820** and **830** may be used so that the flow of the insulating material **15** is not disturbed. However, instead of using the guide members **820** and **830**, as illustrated in FIG. **49**, the drainage pipe **755** for draining the condensed water generated in the refrigerant pipe P through which the refrigerant flows or in the first evaporator E**1** to the outside of the body **10** may be disposed between the inner case **11** and the outer case **13** of the side of the body **10** so that the flow of the insulating material **15** may not be disturbed when the insulating material **15** is foamed in the space between the inner case **11** and the outer case **13** of the rear side of the body **10**.

As described above, according to the example embodiments of the disclosure, even when a thickness of the insulating material is reduced, rigidity may be maintained using a reinforcement structure so that deformation of a body may be reduced.

In addition, an electric apparatus box may be disposed in a hinge cover so that spatial utility may be improved. A fire that breaks out in the electric apparatus box may be prevented from being spread toward an outside of the electric apparatus box.

Furthermore, a heating pipe may be disposed adjacent to an outer case so that dew condensation that occurs in an outer surface of the outer case may be prevented, and the heating pipe may be easily fixed to the inner case.

Although example embodiments of the disclosure have been shown and described, it would be appreciated by those skilled in the art that changes may be made to these embodiments without departing from the principles and spirit of the disclosure, the scope of which is defined in the claims and their equivalents.

What is claimed is:

1. A refrigerator comprising:

a body comprising an inner case in which a storage compartment is formed, an outer case that is coupled to an outside of the inner case and constitutes an exterior, and an insulating material disposed between the inner case and the outer case; and

a reinforcement member disposed between the inner case and the outer case of both sides of the body to prevent deformation of the body,

wherein

the reinforcement member is disposed at both sides of the body in a widthwise direction, and

a first portion of the reinforcement member is attached to the inner case and is connected to one end of a second portion of the reinforcement member which is bent away from a side surface of the inner case, and a third portion of the reinforcement member is attached to the inner case and is connected to another end of the second portion of the reinforcement member so that a gap including the insulating material is provided between the side surface of the inner case and the second portion of the reinforcement member.

2. The refrigerator of claim **1**, wherein the reinforcement member comprises a first reinforcement member disposed at an upper portion of both sides of the body and a second reinforcement member disposed at a lower portion of both sides of the body.

3. The refrigerator of claim **2**, wherein the reinforcement member is disposed to have a thickness of about 0.5 mm.

4. The refrigerator of claim **3**, wherein the reinforcement member is disposed to have a cross-section having an uneven shape, the cross-section having a larger thickness

than a thickness of the reinforcement member and a smaller height than a distance between the inner case and the outer case.

5. A refrigerator comprising:

an inner case in which a storage compartment is formed;

an outer case that is coupled to an outside of the inner case and constitutes an exterior;

an insulating material disposed between the inner case and the outer case; and

a reinforcement member disposed between the inner case and the outer case to prevent deformation of the inner case and the outer case that occurs due to a difference in quantities of thermal contraction of the inner case and the outer case when the insulating material is foamed between the inner case and the outer case and then is solidified, the reinforcement member comprising:

a first portion attached to a side surface of one of the inner case and the outer case,

a second portion connected at one end to the first portion and bent away from the side surface of the one of the inner case and the outer case, and

a third portion attached to the one of the inner case and the outer case and connected to another end of the second portion so that a gap including the insulating material is provided between the side surface of the one of the inner case and the outer case and the second portion.

6. The refrigerator of claim **5**, wherein the reinforcement member is disposed to correspond to a direction in which the insulating material is foamed between the inner case and the outer case and flows.

7. The refrigerator of claim **6**, wherein the reinforcement member is disposed at both sides of the inner case in a widthwise direction and is attached to the inner case.

8. The refrigerator of claim **6**, wherein the reinforcement member is disposed at both sides of the outer case in a widthwise direction and is attached to the outer case.

9. The refrigerator of claim **6**, wherein the reinforcement member is disposed at both sides of the inner case in a lengthwise direction and is attached to the inner case.

10. The refrigerator of claim **6**, wherein the reinforcement member is disposed at both sides of the outer case in a lengthwise direction and is attached to the outer case.

11. A refrigerator comprising:

an inner case in which a storage compartment is formed;

an outer case that is coupled to an outside of the inner case and constitutes an exterior;

an insulating material disposed between the inner case and the outer case; and

a reinforcement member disposed between the inner case and the outer case at both sidewalls of the inner case to prevent deformation that occurs in a lateral direction of the inner case and the outer case due to a difference in quantities of thermal contraction between the inner case and the outer case when the insulating material is foamed and then is solidified, the reinforcement member comprising:

a first portion attached to a side surface of one of the inner case and the outer case,

a second portion connected at one end to the first portion and bent away from the side surface of the one of the inner case and the outer case, and

a third portion attached to the one of the inner case and the outer case and connected to another end of the second portion so that a gap including the insulating material is provided between the side surface of the one of the inner case and the outer case and the second portion.

12. The refrigerator of claim **11**, wherein the reinforcement member is disposed to correspond to a direction in which the insulating material is foamed between the inner case and the outer case and flows.

13. The refrigerator of claim **12**, wherein the reinforcement member is disposed at both sides of the inner case in a widthwise direction and is attached to the one of the inner case and the outer case using an adhesive.

14. The refrigerator of claim **12**, wherein the reinforcement member is disposed at both sides of the inner case in a lengthwise direction and is attached to the one of the inner case and the outer case using an adhesive.

15. The refrigerator of claim **11**, wherein the reinforcement member is disposed to have a thickness of about 0.5 mm and is formed of steel.

16. The refrigerator of claim **11**, wherein the reinforcement member is disposed to have a cross-section having an uneven shape, the cross-section having a larger thickness than a thickness of the reinforcement member and a smaller height than a distance between the inner case and the outer case.

17. The refrigerator of claim **11**, further comprising a reinforcement frame disposed at a front side of the refrigerator to supplement rigidity of the body, the reinforcement frame including at least one of an upper reinforcement frame coupled to an upper portion of the front side of the inner case, an intermediate reinforcement frame coupled to a central portion of the front side of the inner case, a lower reinforcement frame coupled to a lower portion of the front side of the inner case, and a side reinforcement frame coupled to a lower side portion of the front side of the inner case.

18. A refrigerator comprising:

an inner case in which a storage compartment is formed;

an outer case that is coupled to an outside of the inner case and constitutes an exterior;

an insulating material disposed between the inner case and the outer case; and

a reinforcement member disposed in the insulating material between the inner case and the outer case at a side of the body, and being attached to one of the inner case and the outer case, the reinforcement member comprising:

a first portion attached to a side surface of one of the inner case and the outer case,

a second portion connected at one end to the first portion and bent away from the side surface of the one of the inner case and the outer case, and

a third portion attached to the one of the inner case and the outer case and connected to another end of the second portion so that a gap including the insulating material is provided between the side surface of the one of the inner case and the outer case and the second portion.

19. The refrigerator of claim **18**, further comprising a vacuum insulation panel disposed between the inner case and the outer case together with the insulating material,

wherein the reinforcement member is attached to the side surface of the inner case and the second portion is bent away from the side surface of the inner case toward the vacuum insulation panel.

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